A FAWCETT PUBLICATION

DECEMBER
NSC

MECHANIX ILLUSTRATED

(Reg. U. S. Pat. Off.)

15¢

SPECIAL PHOTOGRAPHY SECTION • SEE PAGE 107

THRILLS AND SPILLS WITH MIDGET RACERS

Daring Death for Underwater Gold

MECHANIX ILLUSTRATED

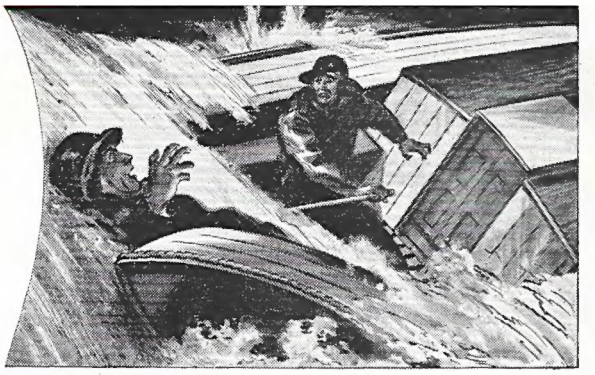
1938

15 CENTS

"GOODBYE WORLD! MY SHIP FADED INTO THE NIGHT!"

OVERBOARD IN STORM, YACHTSMAN CLINGS TO CAPSIZED DORY AS SLOOP HOLDS COURSE

❶ "My 40-foot sloop was footing it up Long Island Sound like a scared cat before a stiff sou'-west breeze," writes Tom Meyer of 280 Bronxville Road, Bronxville, N. Y. "At midnight...



❷ ...off Smithtown Bay, it really began to blow. My partner, Larry Starr, was asleep below, and I gave the tiller to a friend who had done no sailing before, so I could get the dinghy in on deck before it got away from us. Then, with the darn thing half-way on board a big comber pounded over the stern, swept my feet out from under me and overboard I went, weighted down with boots and oilskins. I still clung to the dinghy, but its line had parted and my ship faded quickly into the black night!

❸ "The lad at the tiller didn't know how to bring the ship about, and although he would wake Larry, they'd be too far away to ever find me in that roaring darkness.

"I was growing numb with cold. I couldn't hang on much longer. I rolled against the gunwale of the dinghy for a fresh grip on the world that was slipping away from me. Something hard dug into my side... the flashlight in my pocket! Soaked, though it was, here was a chance!

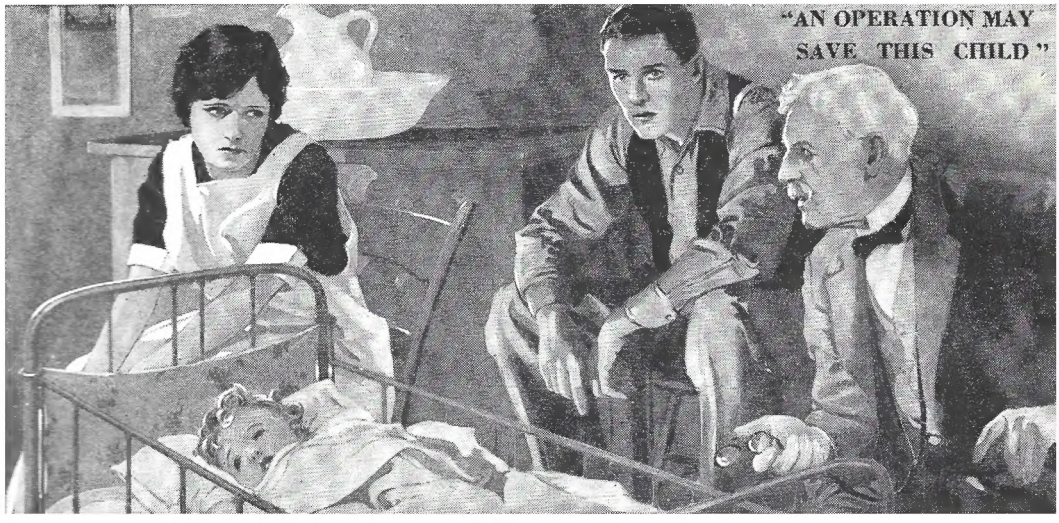
❹ "I pressed the switch. A finger of light stabbed through the storm. Time dragged on as I played the light about me. I cursed my shipmates. 'Why can't the fools see my light?' and then...the beam caught the white sail! I screamed for joy. An arm waved encouragement. Minutes later, thanks to those *fresh* DATED 'Eveready' batteries that kept working under the toughest conditions imaginable, I was warm and happy in my own bunk on my own ship, our Block Island cruise resumed.

(Signed) Tom Meyer"

FRESH BATTERIES LAST LONGER... *Look for the* DATE-LINE

NATIONAL CARBON COMPANY, INC., 30 EAST 42nd STREET, NEW YORK, N. Y.

Unit of Union Carbide UCC *and Carbon Corporation*



"...and I had no money"

"A MAN can knock along on what he's making until something happens! Then when the emergency comes and the money he *hasn't got* could do so much, the cold realities of life haunt him.

"I know what I am talking about! I'll never forget the time when my child's life was at stake. Not an extra dollar to my name. If it hadn't been for friends. . . .

"But *now* I am able to meet the emergencies of life without depending on my friends. I studied an International Correspondence Schools Course and got the *training* I needed to earn more money. It was the wisest thing I ever did. I realize it every time I get another promotion!"

Among the 100,000 students of the I. C. S. are men who are competing with you for that better paying job you'd like to have.

I. C. S. is ready to plan a program of home study for you . . . provide texts written by outstanding authorities . . . provide instruction which is personalized to fit your needs . . . in short, to do for you what we have done for thousands of men who today are well-paid, *trained* men.

INTERNATIONAL CORRESPONDENCE SCHOOLS

BOX 2324-R, SCRANTON, PENNA.

★ Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X: ★

TECHNICAL AND INDUSTRIAL COURSES

☐ Architect	☐ Sheet Metal Worker	☐ Commercial Refrigeration	☐ Surveying and Mapping
☐ Architectural Draftsman	☐ Boilermaker	☐ Plumbing ☐ Steam Fitting	☐ Bridge Engineer
☐ Building Estimating	☐ Telegraph Engineer	☐ Heating ☐ Ventilation	☐ Bridge and Building Foreman
☐ Contractor and Builder	☐ Telephone Work ☐ Radio	☐ Air Conditioning and Cooling	☐ Chemistry ☐ Pharmacy
☐ Structural Draftsman	☐ Mechanical Engineering	☐ Steam Engineer	☐ Coal Mining
☐ Structural Engineer	☐ Mechanical Draftsman	☐ Steam Electric Engineer	☐ Mine Foreman ☐ Fire Bosses
☐ Management of Inventions	☐ Machinist ☐ Toolmaker	☐ Marine Engineer	☐ Navigation
☐ Electrical Engineer	☐ Patternmaker	☐ R. R. Locomotives	☐ Cotton Manufacturing
☐ Electric Lighting	☐ Diesel Engines	☐ R. R. Section Foreman	☐ Woolen Manufacturing
☐ Welding, Electric and Gas	☐ Aviation Engines	☐ Air Brakes ☐ R. R. Signalmen	☐ Agriculture
☐ Reading Shop Blueprints	☐ Auto Technician	☐ Highway Engineering	☐ Fruit Growing
☐ Heat Treatment of Metals	☐ Auto Electrical Technician	☐ Civil Engineering	☐ Poultry Farming

BUSINESS TRAINING COURSES

☐ Business Management	☐ Bookkeeping	☐ Service Station Salesmanship	☐ Grade School Subjects
☐ Industrial Management	☐ Secretarial Work	☐ First Year College Subjects	☐ High School Subjects
☐ Traffic Management	☐ Spanish	☐ Business Correspondence	☐ College Preparatory
☐ Accountancy	☐ French	☐ Stenography and Typing	☐ Illustrating
☐ Cost Accountant	☐ Salesmanship	☐ Civil Service ☐ Mail Carrier	☐ Cartooning
☐ C. P. Accountant	☐ Advertising	☐ Railway Mail Clerk	☐ Lettering Show Cards ☐ Signs

DOMESTIC SCIENCE COURSES

☐ Home Dressmaking	☐ Advanced Dressmaking	☐ Foods and Cookery
☐ Professional Dressmaking and Designing		☐ Tea Room and Cafeteria Management, Catering

Name.....*Age*.....*Address*.....

City.....*State*.....*Present Position*.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada
If you reside in England, send coupon to I. C. S., 71 Kingsway, London, W. C. 2, England

PRICE
15 CENTS

SAME PRICE
IN CANADA

MECHANIX ILLUSTRATED

DECEMBER
1938

Volume XXI
Number 2

Circulation over 250,000

Copyright 1938 by Fawcett Publications, Inc.

SPECIAL FEATURES

Thrills And Spills With Midget Racers - - 35
By Stanley Gerstin

Daring Death For Underwater Gold - - - 46
By Charles E. Smale

10,000 Trees In A 15-Foot Nursery - - - 52
By Annie D. Nunn

Second MI Movie - - - - - - - - - 58

Remote Control Gear Shifting In 1939 Cars - 59

Readers' Service Bureau - - - - - - - 62

Submarines In The Future—(MI's "Book Of The Month") - - - - - - - - - - 64

"Men With Wings" Contest Features Many Prizes - - - - - - - 78

Minerals Make Colorful Mounts For The Microscope - - - - - - - - - - 100
By Julian D. Corrington, Ph.D.

(Continued on page 6)

TOY INVENTIONS

(Make money while you play!)

IN THE basement of a private house in Rochester, N. Y., Edward S. Savage works amid a weird collection of fantastic figures. This is the workshop of Fairyland where toys are born, for Mr. Savage is America's No. 1 toy inventor. With the Walking Pig, the Crawling Bug, Jack the Kicking Donkey and Otto the Snoopy Sniffer as his companions, the man whose gadgets delight children and grown-ups thinks up the ideas that net him a modest fortune. How this toy inventor makes money while he plays will be told in the January issue.

"CRACKING Down On Quacks," the story of those mail order operators whose wonder-working lotions, stretching devices and other impressive appearing contraptions are used to bamboozle a credulous public out of millions of dollars each year, will also be told next month, as well as the story of how meterologists are using new radio devices to enable them to do something about the weather.

CAMERA SECTION

Portable Darkroom Is Practical Photo Aid - - - - 41
Negative Viewer Aids Photography Fans - - - - - 43
Winners Of Photo Awards - 107
Dress Up Your Prints - - - 108
Copying With The Enlarger - 111
Hints For Camera Fans - - 112
Sight For Electric Photometer - - - - - - - - 114
Amateur Photo Puzzlers - - 116

Published monthly by Fawcett Publications, Inc., 11th Street and Broadway, Louisville, Kentucky. Executive Office—22 W. Putnam Avenue, Greenwich, Connecticut. Editorial and Advertising offices—1501 Broadway, New York, New York. Send subscriptions to the Louisville, Kentucky, or Greenwich, Connecticut, addresses.

Entered as second-class matter under the Act of March 3, 1879, at the post office in Louisville, Ky., with additional entry at Greenwich, Conn. Not responsible for unsolicited manuscripts. In U. S. and Possessions and in Canada, 15c a copy; $1.50 a year. Other Postal Unions, $2.00 a year. East Indian Agent, P. C. Erance Sons, Bombay, India. Printed in U. S. A. Advertising forms close the first of second month preceding date of issue. Advertising offices: New York, 1501 Broadway; Chicago, 360 N. Michigan Ave.; San Francisco, Simpson-Reilly, 1014 Russ Bldg.; Los Angeles, Simpson-Reilly, Garfield Bldg. Member Audit Bureau of Circulation.

W. H. FAWCETT, Publisher RALPH DAIGH, Managing Editor ROBERT HERTZBERG, Editor AL ALLARD, Art Director
JOHN L. SCHERER, CLIFFORD PETERS, STANLEY GERSTIN, Associate Editors S. S. RABL, Naval Consultant

YES- I'M CONVINCED THAT I CAN MAKE GOOD MONEY IN RADIO. I'M GOING TO START TRAINING FOR RADIO RIGHT NOW.
NO- NOT ME. I'M NOT GOING TO WASTE MY TIME. SUCCESS IS JUST A MATTER OF LUCK AND I WASN'T BORN LUCKY.

BILL SAID "YES" HE'S MAKING GOOD MONEY IN RADIO NOW
THIS N.R.I. TRAINING IS GREAT. AND THEY SENT REAL RADIO PARTS TO HELP ME LEARN QUICKLY
YOU CERTAINLY KNOW RADIO. MINE NEVER SOUNDED BETTER.
I'VE BEEN STUDYING RADIO ONLY A FEW MONTHS AND I'M ALREADY MAKING GOOD MONEY IN MY SPARE TIME
THANKS
OH BILL! I'M SO PROUD OF YOU. YOU'VE GONE AHEAD SO FAST IN RADIO
YES! I'VE GOT A GOOD JOB NOW AND A REAL FUTURE. THANKS TO N.R.I. TRAINING
TOM SAID "NO" HE'S STILL WAITING FOR "LUCK"
BILL'S A SAP TO WASTE HIS TIME STUDYING RADIO AT HOME
SAME OLD GRIND -- SAME SKINNY PAY ENVELOPE -- I'M JUST WHERE I WAS FIVE YEARS AGO
GUESS I'M A FAILURE. LOOKS LIKE I'LL NEVER GET ANYWHERE
YOU'LL ALWAYS BE A FAILURE, TOM, UNLESS YOU DO SOMETHING ABOUT IT. WISHING AND WAITING WON'T GET YOU ANYWHERE

I WILL TRAIN YOU AT HOME *in Spare Time*

FOR A GOOD RADIO JOB

J. E. SMITH, President
National Radio Institute
Established 1914

Many Radio Experts Make $30, $50, $75 a Week

Radio broadcasting stations employ engineers, operators, station managers and pay up to $5,000 a year. Fixing Radio sets in spare time pays many $200 to $500 a year—full time jobs with Radio jobbers, manufacturers and dealers as much as $30, $50, $75 a week. Many Radio Experts open full or part time Radio sales and repair businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, and pay up to $6,000 a year. Automobile, police, aviation, commercial Radio, loudspeaker systems are newer fields offering good opportunities now and for the future. Television promises to open many good jobs soon. Men I trained have good jobs in these branches of Radio. Read how they got their jobs. Mail coupon.

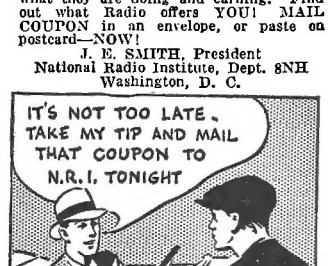
Many Make $5, $10, $15 a Week Extra in Spare Time While Learning

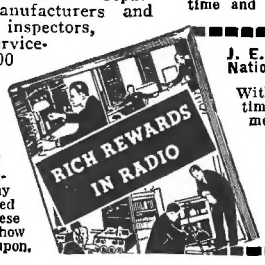
The day you enroll I start sending Extra Money Job Sheets; show you how to do Radio repair jobs. Throughout your training I send plans and directions that made good spare time money—$200 to $500—for hundreds, while learning. I send you special Radio equipment to conduct experiments and build circuits. This 50-50 method of training makes learning at home interesting, fascinating, practical. I ALSO GIVE YOU A MODERN, PROFESSIONAL ALL-WAVE, ALL-PURPOSE RADIO SET SERVICING INSTRUMENT to help you make good money fixing Radios while learning and equip you for full time jobs after graduation.

Find Out What Radio Offers You

Act Today. Mail the coupon now for "Rich Rewards in Radio." It's free to any fellow over 16 years old. It points out Radio's spare time and full time opportunities and those coming in Television; tells about my training in Radio and Television; shows you letters from men I trained, telling what they are doing and earning. Find out what Radio offers YOU! MAIL COUPON in an envelope, or paste on postcard—NOW!

J. E. SMITH, President
National Radio Institute, Dept. 8NH
Washington, D. C.





**J. E. SMITH, President, Dept. 8NH,
National Radio Institute, Washington, D.C.**

Without obligating me, send "Rich Rewards in Radio," which points out spare time and full time opportunities in Radio and explains your method of training men at home to be Radio Experts. (Please Write Plainly.)

NAME..... AGE.....

ADDRESS .....

CITY..... STATE.....

INVENTORS
PATENT YOUR IDEAS
SEND FOR FREE BOOK

HOW TO OBTAIN A PATENT

Written by a Former Member of the Examining Corps (1922-24) of the U. S. Patent Office. If you want to profit by your idea, you should take steps to apply for a U. S. Patent at once. Your first step is to get this Free Book. This interesting illustrated book contains valuable information you should have. It tells you fully how to obtain a patent on your idea in the quickest way. With this Free Book you will also receive a "Record of Invention" form on which you can easily record your idea. Personal and Confidential Service: Your case will be personally handled only by a Registered Patent Attorney who is also a Former Member of the Examining Corps of the U. S. Patent Office. All communications confidential.

MAIL COUPON TODAY for FREE PATENT BOOK and RECORD OF INVENTION Form

CARL MILLER
REGISTERED PATENT ATTORNEY
FORMER MEMBER EXAMINING CORPS U. S. PATENT OFFICE

Woolworth Bldg., 35th Floor, Dept. 128B, New York City
MILLER BUILDING, Dept. 128B, WASHINGTON, D.C.
Please send me your Free Book, "How to Obtain a Patent," and your "Record of Invention" form.

NAME .....

ADDRESS .....

INVENTORS
BE SUCCESSFUL

DIARY OF INVENTION. When you have little money do you know how to protect your invention? This diary is a pocket size book for keeping a diary record to protect your priority rights. Price 25c.
INVENTION & FINANCE MAGAZINE is written for intelligent inventors who are willing to earnestly work for success. Two year subscription $1.00 entered upon promise to pay on receipt of first copy.
PLACE YOUR ORDER by checking item you desire. Then cut out and mail this advertisement.

☐ Send subscription ☐ Send Diary

INVENTION & FINANCE MAGAZINE
80-H Wall Street, New York, N. Y.

PATENTS
PERSONAL SERVICE

My *Personal* service assures strictest confidence on all your patent problems. Send me a model or drawing, or sketch and description of your invention, and $5.00. I will make a search and report promptly as to its patentability and send you a copy of my 72-page booklet. Or, if you prefer to read my booklet first, write today for FREE copy. Registered Patent Attorney.

L. F. Randolph, 761 Victor Building, Washington, D. C.

"GIFTMAKER SR."
Outside U.S.A. & C.O.D. $5.15

New 24" LATHE
$4.90 POST PAID
Free Catalog:

A heavy duty, smooth running wood lathe at a remarkable price. 32" long, 7" high. Turns pieces 4½" in diameter by 24". Fully adjustable, 2-speed. Weighs 10 lbs. Long and short tool rests. OILLESS bushings. Satisfaction guaranteed or money back.

Free Catalog describing $150 prize contest (1st prize, $25; 2nd, $15; 3rd, $10; 66 other cash and merchandise prizes). Cat. illustr. complete power tool line: Jig Saw, $1.50; Shaper, Circular Saw with oilless bearings, $3 each; Drill Press, $2.50; 9½" Lathe, $2; Sander, $1; etc. Order today or send card for Catalog.

J & H Metal Products Co. 8 Commercial St. Rochester, N. Y.

CONTENTS—Continued from page 4

SHORTER FEATURES

Building Tomorrow's Warships In Miniature - - - - - - - - - - - - - - - 42
Goldbeating—A Passing Art - - - - - - 44
Collector Buys 200,000 Patent Models - - 67
Television Tour For Radio City Visitors - - 71
DC-4 Airliner Has Powerful Radio - - - 76
The Serpent's Trail - - - - - - - - - 82

HOW-TO-BUILD FEATURES

Solid Wood Cigarette Case - - - - - - 83
New Uses For Old Shoes - - - - - - - 84
Build The MI "Sky Flea" - - - - - - - 88
Build "Ice Sprite"—A Four-Runner Ice Boat - - - - - - - - - - - - - - - 90
Northern Snowshoes Are Easy To Make - - 94
Combination Pipe Rack And Tray - - - 98
Automatic Hot Air Heater For Shop Or Office - - - - - - - - - - - - - - 102

WORKSHOP KINKS

Easily Constructed Lathe Does Simple Turning Jobs - - - - - - - - - - - - - 87
Old Piston Ring Polishes Shafts - - - - 87
Simple Cleaner Made From Hose - - - - 87

AUTOMOTIVE

New Auto Safeguard Protects Pedestrians - 45
Clutchless Auto Passes Test - - - - - - 51
De Luxe Trailer Requires Specially Built Tow Car - - - - - - - - - - - - - 51
Air Cleaner Removes Dirt From Intake - - 70
Devil-Face Auto Lamp Warns Of Speeding - 72
Starts 7,000-Mile Trip In 1907 Automobile - 73
Gauge Shows Engine Faults - - - - - - 75
Easily Made Cover Protects Rumble Seat Riders - - - - - - - - - - - - - 99
Paste Cleans Reflectors - - - - - - - - 99

AVIATION

Motor Built For Wind Tunnel - - - - - - 56
"Mosquito" Plane Has Tiny 30 H. P. Motor - 72
"Men With Wings" Contest - - - - - - - 78

RADIO AND ELECTRICITY

Invents New Radio Compass - - - - - - 66
Tiny Television Set Devised - - - - - - 66
Experiments With Magnets - - - - - - 96
Radio Sparks - - - - - - - - - - - - 106

[*Continued on page 8*]

for quick action

SEND TO-DAY

MAIL COUPON NOW

for Free Book and Record of Invention Form

CLARENCE A. O'BRIEN and HYMAN BERMAN
317-L Adams Building, Washington, D. C.
Registered Patent Attorneys Before U. S. Patent Office

Please send me at once your Big Free 48-Page Book "Patent Guide For the Inventor" and your Specially Prepared "Record of Invention" Form. This request does not obligate me.

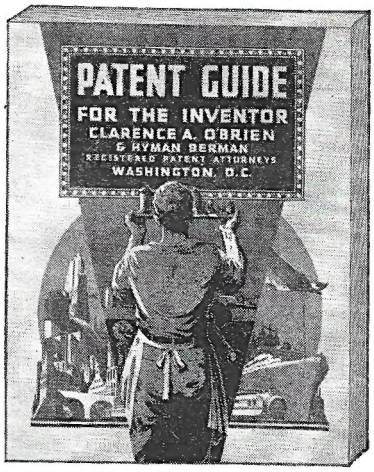
Name .....

Address .....

City.....

(Please write or print plainly) State.....

YOU CAN PATENT



REQUEST OUR BOOK—NOW!

Know exactly what you should do to secure a Patent—what must be done every step of the way—how the Patent Law protects you—what we, as Registered Patent Attorneys, can do for you. **Mail the coupon NOW for our Big Booklet and "Record of Invention" Form.**

NEW IDEAS FOR IMPROVEMENTS IN MACHINERY, ARTICLES, DESIGNS, FORMULAS, ETC.

Every year thousands of Patents are granted. Very few, however, represent the discovery of entirely new principles. Most of them provide new methods of doing some everyday thing in a better way—changes for greater efficiency, usefulness, adaptability, or beauty in some previously Patented thing. These IMPROVEMENTS are Patentable if new, and actually represent new invention. These improvement Patents offer large chances for profit if commercially useful. The business world wants improved products and services.

MODELS and FINISHED DRAWINGS UNNECESSARY

Our Big Book tells you how you can start immediately to apply for Patent Protection even if you haven't finished models or drawings available now. It will tell you how we can prepare the specifications and finished drawings necessary in the form prescribed by the Patent Office—so as to secure for you full Patent Protection. **Mail Coupon for Our Big Book TODAY.**

OUR SERVICES TO YOU

We are registered Patent and Trade-Mark Attorneys, serving Inventors all over the United States and abroad. Our Organization is complete. We have Draftsmen, experienced Searchers and Attorneys to serve your interests. We can act as your legal adviser in all Patent Matters. Our complete service is described in Our Big Book. **Mail Coupon for it NOW.**

IN CASE YOU FEEL THAT YOU HAVE NOT SUFFICIENT FUNDS AVAILABLE FOR PATENT FEES

Our Big Book tells you how to legally assign an interest in your invention—**before filing application**—to some friend willing to aid you. Better to do this than to delay indefinitely and see another inventor develop your idea and Patent it before you do. **Send Coupon NOW.**

REASONABLE FEES—CONVENIENT TERMS

Don't worry about finances. Our fees are very reasonable—we can arrange convenient terms of payment. It is our custom to permit clients to pay for our services in installments as the application progresses in our office. See our Big Book for fees in obtaining Patent. It explains our arrangements clearly. **Send for it NOW.**

CLARENCE A. O'BRIEN & HYMAN BERMAN

317-L ADAMS BUILDING **Registered Patent Attorneys** **WASHINGTON, D. C.**

Learn AUTO Mechanics QUICKLY IN A FEW WEEKS

Good-Pay Jobs Are Available! Trained men earn top wages in these fascinating well-paying trades. This is not a correspondence school—no books—no lessons. Don't look for a job—TRAIN FOR IT. Read below how a McSweeny-trained man made good.

LEARN EASILY, QUICKLY:

- **AUTO MECHANICS**
- **AVIATION MECHANICS**
- **DIESEL MECHANICS**

Collision Repair (Complete)
Body and Fender Repair
Auto Painting

- **WELDING—Arc and Gas**

You Get Actual Shop Training

Work on real equipment with real tools. In a few weeks you should be trained by actual work to hold down a Good Pay Job.

We get many letters like this

1801 E. 65th St., Cleveland, O. Dear Mac—Immediately after leaving school I went to work for United Motors and am now located in Cleveland where I hold a good position. I have been able to take care of the most complicated electrical jobs. I think I have done fine considering I had no experience before coming to your school. —Hubert Todd

LEARN NOW—PAY LATER!

We will give you complete information on how to get your training now and pay for it later out of your earnings.

FREE Write today for Big Free Book. Get the facts about jobs; and low Tuition Offers. Mailing the coupon does NOT obligate you. It obligates ME to tell YOU how you can train for Big Money in a few short weeks. Address Dept. 11-12.

McSWEENY SCHOOLS

DETROIT, MICH. and KANSAS CITY, MO.

Write Our School Nearest You

In Big New McSweeny Buildings

The finest of their kind. Every modern facility for thorough instructions.

McSWEENY TRADE SCHOOL
Dept. 11-12, Detroit, Mich., or Kansas City, Mo.
Without cost or obligation send me your big FREE Book.

I am interested in the course on _____

Name _____

Street _____

Town _____ **State** _____ **Age** _____

CONTENTS—Continued from page 6

NEW MECHANICAL DEVICES

"Iron Lung" Goes Quadruple - - - - - 43
Swamp Buggy Uses Plane Propellers - - - 45
Rollers Curve Steel Sheets - - - - - - 57
Table Lamp Holds Magazine - - - - - 57
Workshop Designed For Front Line Use - - 68
New Insect Killer Uses Infra-Red Ray - - 69
Device Determines Line Plunge Force - - 69
Oil Can Carries Own Illumination - - - - 69
Metal-Working Lathe Boasts New Features - 73
Instrument Tests Motor Oil - - - - - 75
Truck Enables One Man To Move Piano Up, Down Stairs - - - - - - - - - - - 77
Cotton Picker Device Mounted On Tractor - 77
World's Largest Gold Dredge In Operation - 81
New Army Rifle Shoots Five Times Faster - 81

DEPARTMENTS

Chips From The Editor's Workbench - - 12
Crafts And Hobbies - - - - - - - - - 83
Radio Sparks - - - - - - - - - - - 106
Photography Section—Winners Of Photo Awards - - - - - - - - - - - - 107
New Ideas for Home and Shop - - - - - 146

MISCELLANEOUS

New English Ocean Liner Will Be World's Largest - - - - - - - - - - - - 41
Gigantic Sieve Clears River - - - - - 43
MI Boat Starts On Trip To South Seas - - 45
Blind Man Invents "Polycord" - - - - - 51
"Claws" Aid Berry Pickers - - - - - - 56
Lightweight Self-Contained Helmet-Suit Has Many Uses - - - - - - - - - - - 56
Waterproof Roofing Formed As Interlocking Slabs - - - - - - - - - - - - 57
Buys Unique Railroad And Car Equipment For $301 - - - - - - - - - - - - 66
Model Duplicates Palomar Observatory - - 68
New Pill-Box Fort Erected In Four Hours - 70
Gameboard Cheers Invalids - - - - - 72
Drive-In Theater Has Room For 500 Cars - 73
New Lamp Is "Midget Sun" - - - - - 74
Novel Clock Boasts 93 Dials - - - - - 74
Builds Home And Furniture From Old Newspapers - - - - - - - - - - - - 75
Makes 14-Mile Underwater Trip In Home-Built "Sub" - - - - - - - - - - - 77
Model Midget Racing Auto Attains Speed Of 45 M. P. H. - - - - - - - - - - 81

IF you're that man, here's something that will interest you.

Not a magic formula—not a get-rich-quick scheme—but something more substantial, more practical.

Of course, you need something more than just the desire to be an accountant. You've got to pay the price—be willing to study earnestly, thoroughly.

Still, wouldn't it be worth your while to sacrifice some of your leisure in favor of interesting home study—over a comparatively brief period in your life? Always provided that the rewards were good—a salary of $2,000 to $10,000?

An accountant's duties are interesting, varied and of real worth to his employers. He has *standing!*

Do you feel that such things aren't for you? Well, don't be too sure. Very possibly they *can* be!

Why not, like so many before you, investigate LaSalle's modern Problem Method of training for an accountancy position?

Just suppose you were permitted to work in a large accounting house under the personal supervision of an expert accountant. Suppose, with his aid, you studied accounting principles and solved problems day by day—easy ones at first—then the more difficult ones. If you could do this—and if you could turn to him for advice as the problems became complex—soon you'd master them all.

That's the training you follow in principle under the LaSalle Problem Method.

You cover accountancy from the basic Elements right up to Accountancy Systems. Later, you choose from twelve post-graduate electives, including C. P. A. coaching.

As you go along, you absorb the principles of Auditing, Cost Accounting, Business Law, Organization, Management and Finance.

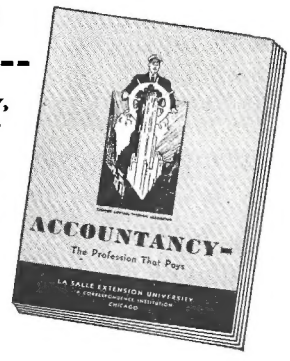
Your progress is as speedy as you care to make it—depending on your own eagerness to learn and the time you spend in study.

Will recognition come? The only answer, as you know, is that success *does* come to the man who is really *trained.* It's possible your employers will notice your improvement in a very few weeks or months. Indeed, many LaSalle graduates have paid for their training—with increased earnings—before they have completed it! For accountants, who are trained in organization and management, are the executives of the future.

Write For This Free Book

For your own good, don't put off investigation of *all* the facts. Write for our free 48-page book, "Accountancy, The Profession That Pays." It'll prove that accountancy offers brilliant futures to those who aren't afraid of serious home study. Send us the coupon *now.*

Over 1650 Certified Public Accountants among LaSalle alumni



LASALLE EXTENSION UNIVERSITY, Dept. 12493-HR, Chicago, Ill.
I want to be an accountant. Send me, without cost or obligation, the 48-page book, "Accountancy, The Profession That Pays," and full information about your accountancy training program.

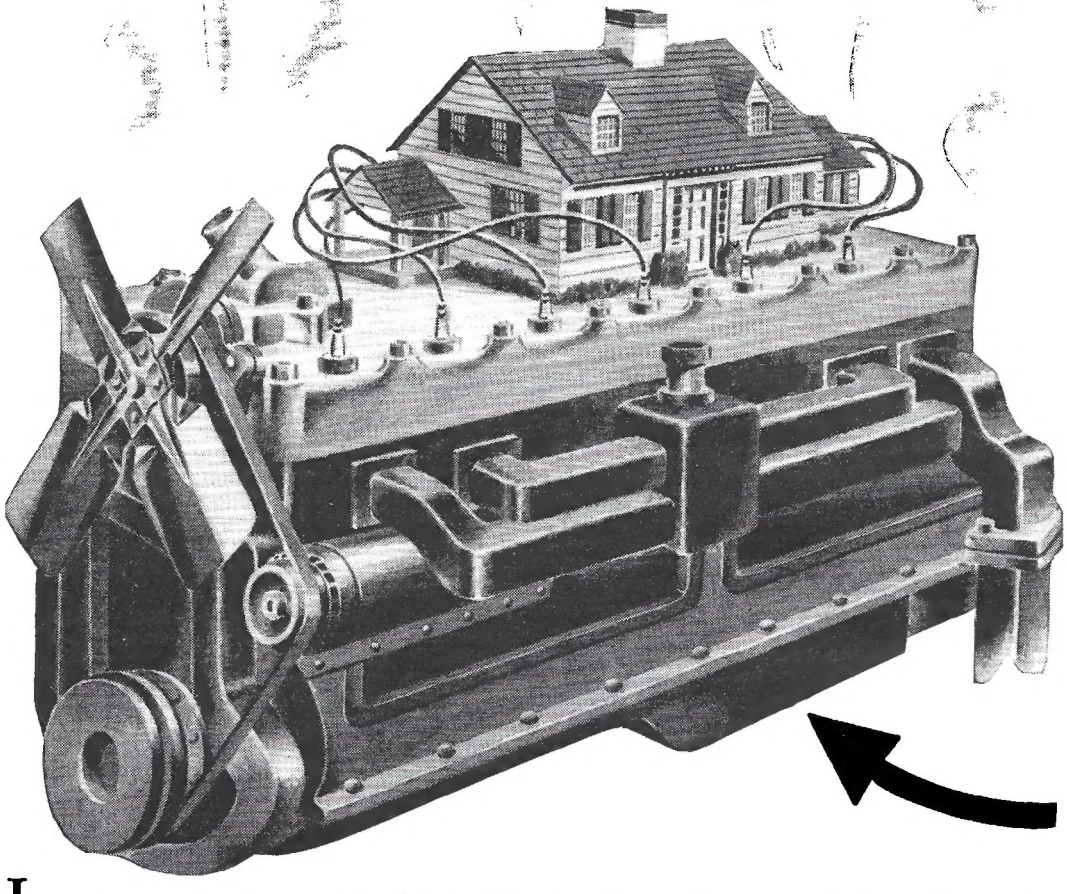
Name.....

Address..... *City*.....

Position..... *Age*.....

LASALLE EXTENSION UNIVERSITY
A CORRESPONDENCE INSTITUTION

Engine HEAT, *not winter's cold,*



LABORATORY RESEARCH and experiments show that an automobile engine under full load and at high speed may generate sufficient heat to warm a six room house to 70 degrees on a zero day! That shows you what a big job the cooling system has to do...and why anti-freezes that can't stand heat must be replaced from time to time throughout the winter.

The boiling point of a 50 per cent solution of alcohol and water is only about 180 degrees. This is important when you consider that modern high-compression motors operate at temperatures up to the 180 mark, *and*

is the real test of an ANTI-FREEZE

THE HEAT FROM YOUR MOTOR WOULD WARM A SIX ROOM HOUSE!

even above! Further, when you shut off the engine, the heat left in the motor jumps the solution temperature as much as 20 degrees. When an alcohol solution gets hot enough to boil, steam is formed inside the engine and the pressure of this steam forces anti-freeze solution out the radiator overflow pipe onto the ground.

Even if these solution losses are small, they soon add up to a serious total loss of anti-freeze protection with the many stops a car makes in normal driving. Since the driver is rarely conscious of this *hidden boiling* that steals his anti-freeze, a freeze-up in the next cold snap is usually his first warning.

But why consider trouble that *doesn't need to happen?* Put in "Eveready" "Prestone" Anti-freeze today and be done with cooling worries for the whole winter. "Prestone" Anti-freeze contains no alcohol...will not boil off under any winter weather conditions.

The words "Prestone" and "Eveready" are trade-marks of National Carbon Company, Inc.

"EVEREADY" "PRESTONE"

TRADE-MARKS

Anti-freeze is Guaranteed in *Writing*

COSTS MORE BY THE GALLON, LESS BY THE WINTER

Chips from the Editor's Workbench

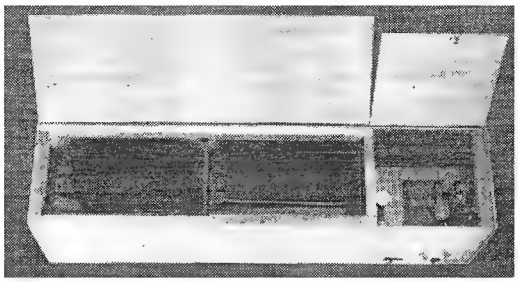
Send in photos of your completed workshop projects. Each month Mechanix Illustrated awards a first prize of $5 for the best photo and letter received by this department and prizes of $3 each for all other photos and letters used.

Charles Kenney is shown with the graceful 10-foot pusher-type gas-powered model airplane he built from MI plans in the August-September issues.

Builders of gas-powered model airplanes will be intrigued by the photo sent in by Charles Kenney, of Newark, N. J. Winning a $5 prize for Charles, the photo shows the pusher-type XP-3 gas model which he built from plans that appeared in the August and September (1938) issues of MI. Charles says he has flown the model at several contests and it has always attracted the attention and praise of contestants and judges alike. Well, it SHOULD, for it is one of the most interesting models I have ever seen and I've seen many.

***

It has been a long time since MI featured a department that met with such instantaneous success as the Photography Section. Photos of photography projects completed by readers have flooded the Workbench, one of the most recent being that of a cabinet dryer built by Newell Probert, of Seattle, Wash., who was awarded a $3 prize. The dryer is made from plywood and is four feet long with a 12-inch width and depth. A small fan blows the heat from a 660-Watt heating element down through the cabinet, the heated air passing over 20 ferrotype plates. Built at a cost of $3.25, the dryer will dry prints in less than 10 minutes, says proud craftsman Newell.



A real photography enthusiast, Newell Probert built this cabinet dryer at a cost of $3.25. It dries prints in 10 minutes.

***

I'm sure that most MI readers are familiar with the soap box racers that have become so popular within the past few years. Well, the thing to do with the "gravity-powered" cars when you outgrow them is to power them with an old washing machine motor. At least that's what Allan Kreig, of Coeur d'Alene, Idaho, did and he reports that the conversion works out very satisfactorily. Allan fitted the racer with a three-speed transmission and claims it travels at a speed of 20 m.p.h.

Having outgrown his "gravity-powered" soapbox racer, Allan Krieg equipped it with an old washing machine motor, thus converting it into one of the ever popular midget racers.

[*Continued on page* 14]

A Simple Recipe for Inventive Success

PROBABLY the simplest recipe for inventive success would be this: First, a practical, useful invention; second, a good, strong Patent; third, a buyer or a market. The inventor needs all three to get anywhere. Lacking any one, he is likely to get nowhere. The recipe is simple. Working it out isn't so simple. That is why inventors—and others inventively inclined—have found the two books shown here so helpful. We've gone into each part of the recipe carefully. *Exactly what is an invention?* We tell you. *What is a strong Patent?* We tell you. *How can I go about finding a buyer?* We tell you.

But there's much more. For example, just how an Application for a Patent is made; how an inventor can safeguard himself with dated sketches as he goes along; how the pertinent Patent Office records are checked to see what other inventors may have done along the same line; how some successful inventors have secured financial backing; simple ways to contact manufacturers; and many other points.

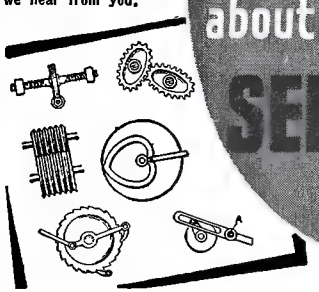
40 Years in the Business of Helping Inventors

The world needs, can use and will pay for practical, useful, inventions. Manufacturers are on the alert for new articles, or improvements that will help them increase sales. Maybe you have one. Maybe not. These books will help you in deciding that. *From that standpoint alone, they are valuable.*

For more than 40 years, it has been our business to help inventors. We answer your questions and supply complete information about Patent procedure, costs, steps to take, kind of sketch or model needed, and much more. Our staff is made up of experienced Registered Patent Attorneys, Draftsmen, Searchers. Fees are reasonable—deferred payments arranged. Whether your idea is large or small, finished or still in a rough stage, you should have the facts both about Patenting and Selling. The information which we give you—based on long experience with thousands of inventors—is yours for the asking. No need to delay. These two books of facts may save you time, trouble, money, even later disappointment. **Return the coupon—or write us a confidential letter—today.**

115 Mechanical Movements

The mechanical movements shown below are taken from 115 such movements illustrated in our book, "Patent Protection." Maybe you'll find just what you need to work out some of your own ideas. Many other interesting pictures are shown in this book. **Both books and an "Evidence of Invention" form sent to you FREE the same day we hear from you.**



PATENT and SELL
your INVENTION
Suggestions on WHEN and HOW to Sell an INVENTION
PATENT PROTECTION
These TWO BOOKS tell you how to go about it – Both SENT FREE
VICTOR J. EVANS & Co.

REGISTERED PATENT ATTORNEYS
MAIN OFFICE: 30-P, VICTOR BUILDING
WASHINGTON, D. C.

OTHER OFFICES: 514-B, Empire Bldg., **Pittsburgh**
405-B, Garfield Bldg., **Los Angeles**
1010-B, Hobart Bldg., **San Francisco**

Send me FREE copies of your books, "Patent Protection" and "When and How to Sell an Invention." Also Free "Evidence of Invention" form. (Note: Same books supplied by any of the other offices listed above.)

Name .....

Street and No. .....

City or Town..... State.....

AUTO
BOOKS SENT FREE

on approval. Just mail the coupon and we'll send you a set of these remarkable auto books, just off the press. Whether you are a mechanic or helper, expert or apprentice, auto owner or driver, if you're interested in knowing all about automobile mechanics, take advantage of this FREE OFFER.

GET A BETTER JOB

A better job—in the gigantic auto industry. BIGGER PAY—a chance to go into business for yourself and get a share of the huge profits, are waiting for any man who even half tries to improve himself. Learn auto engineering with these wonder books a new way—without studying or memorizing. Simply use the JIFFY INDEX to look up the answer to any auto problem. Built by eleven of America's greatest automobile engineers, and written in simple language so you can understand it. Very newest cars, all covered.

CAN YOU FIX IT?

These wonder books tell step by step HOW to take out "play" in differential—to kill the shimmy in steering—to set TIMING—how to put your finger instantly on engine trouble and then the quick expert way to FIX it. Newest improvements fully covered. Equal to a complete trade course at less than a fourth the cost.

6 BIG VOLUMES
Brand New Edition

2500 pages, 2000 illustrations, wiring diagrams, etc., including Marine Engines, Aviation Motors, Diesel engines, etc. De Luxe edition, gold-stamped flexible binding.

FREE Privilege of consulting Automobile Engineers of American Technical Society for one year without cost if you mail Coupon immediately.

Send Now and we will include an EXTRA Volume full of up-to-date diagrams.

AMERICAN TECHNICAL SOCIETY
Drexel Ave. & 58th St., Dept. A9320, Chicago, Ill.
I would like to see the new 6-volume edition of your AUTO BOOKS. I will pay the few cents delivery charges only, but if I choose to, I may return them express collect. If after 10 days use I prefer to keep them, I will send you $2 and pay the balance at the rate of only $3 a month, until $24.80 is paid. Please include free membership and extra Volume 7, as per your offer above.
Name _____
Address _____
City _____ State _____
Attach letter stating age, occupation and name and address of employer and that of at least one business man as reference.

MAKE REAL MONEY
Get Into
ADVERTISING
LEARN AT HOME
Send for FREE Book

Field is uncrowded. Big opportunities await both men and women. Our modern home-study course trains you quickly. No special educational requirements. You learn by doing actual work, under leading Ad men. No textbooks. Low tuition fee, easy terms. Money back if not satisfied. Your 1 cent postcard brings FREE ILLUSTRATED BOOK. Send today. No obligation. Start learning at once!

ADVERTISING INSTITUTE OF AMERICA
100-5th Av. Dept. M-2, New York City

Government Jobs

Positions Clerk Carriers, Rural Carriers, Railway Postal Clerks, Postmasters, File Clerks, and many others. Splendid salaries, easy work, vacation with pay. Common school education sufficient. Examinations often. Established 1896. Send for our Civil Service Catalog No. 9.

Columbian Correspondence College Washington, D. C.

Earn Spare-Time Money
THIS NEW PLEASANT WAY!

Learn how you can build up a profitable spare or full-time business in your own home. This new book "How to Make Money in Woodworking" is crammed with practical tested ideas, plans, and suggestions. Tells you exactly what to make, how to make it and how to sell it. Describes plans that have worked for others. Woodworking, the new way, is light, pleasant, and profitable. Send only 10c and complete book will be mailed postpaid. Satisfaction guaranteed or money refunded. Write to Dept. H1238.

Delta Mfg Co. 600 E. VIENNA AVE. MILWAUKEE, WIS.

Editor's Workbench Chips

[*Continued from page* 12]

This pretty miss is demonstrating the powered scooter constructed by Russell Naeve. Should have two seats, Russ!

Judging from Allan's size, I'd say that he was in danger of outgrowing the powered midget's cockpit. How about it, Allan? Maybe the $3 award I'm sending you will help buy parts for the construction of a bigger racer.

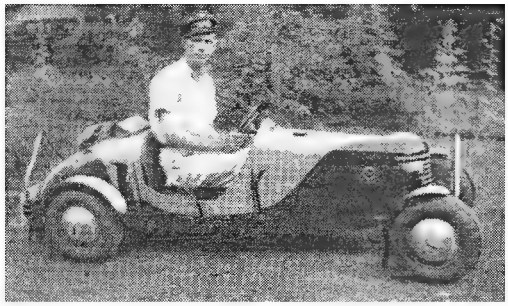
***

Powered scooters continue to rate highly with MI craftsmen and a photo sent in by Russell Naeve, of Ogden, Iowa, shows one he built from half-inch welded gas pipe. Powered by a converted washing machine motor, Russell's scooter attains a speed of 20 m.p.h. Okay, Russ, I'm sending you a $3 prize and I hope you'll treat the young lady who occupys the driver's seat.

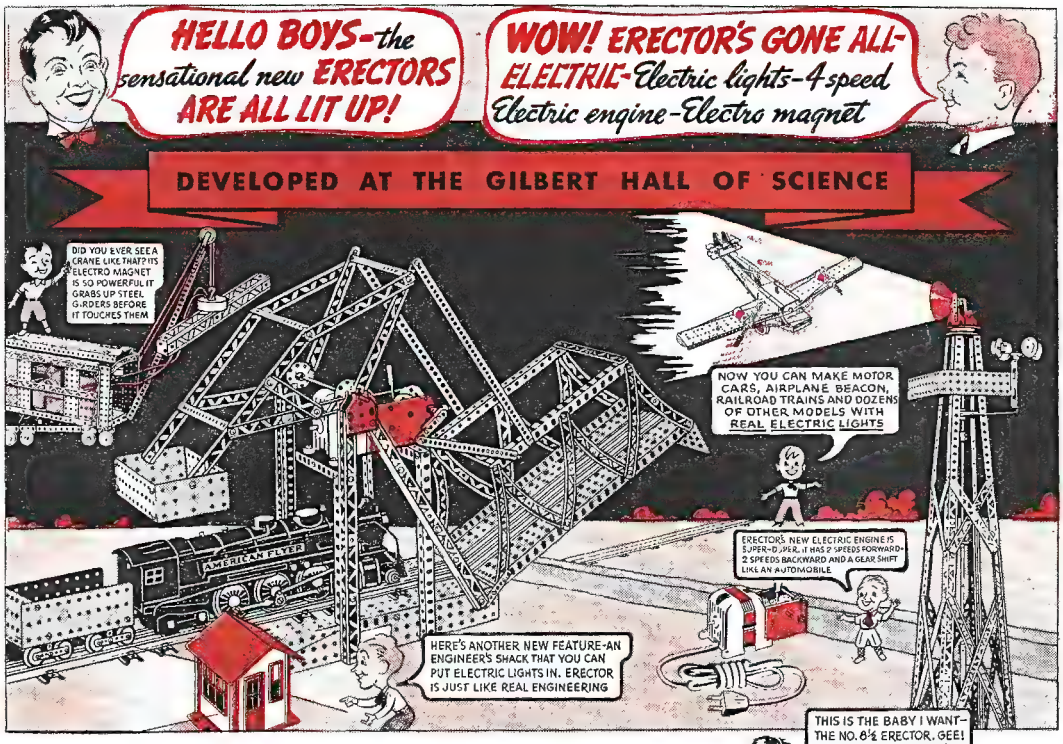
***

A photo of his trim home-built midget racer won a $3 award for William Walker, of Akron, Ohio. Powered by a 3½ horsepower gasoline

[*Continued on page* 16]



Powered by a 3½ horsepower motor, this trim looking midget racer carries builder William Walker at speeds up to 45 m.p.h.


HELLO BOYS-the sensational new ERECTORS ARE ALL LIT UP!
WOW! ERECTOR'S GONE ALL-ELECTRIC-Electric lights-4 speed Electric engine-Electro magnet
DEVELOPED AT THE GILBERT HALL OF SCIENCE
DID YOU EVER SEE A CRANE LIKE THAT? ITS ELECTRO MAGNET IS SO POWERFUL IT GRABS UP STEEL GIRDERS BEFORE IT TOUCHES THEM
NOW YOU CAN MAKE MOTOR CARS, AIRPLANE BEACON, RAILROAD TRAINS AND DOZENS OF OTHER MODELS WITH REAL ELECTRIC LIGHTS
ERECTOR'S NEW ELECTRIC ENGINE IS SUPER-DUPER. IT HAS 2 SPEEDS FORWARD-2 SPEEDS BACKWARD AND A GEAR SHIFT LIKE AN AUTOMOBILE
HERE'S ANOTHER NEW FEATURE-AN ENGINEER'S SHACK THAT YOU CAN PUT ELECTRIC LIGHTS IN. ERECTOR IS JUST LIKE REAL ENGINEERING
AMERICAN FLYER

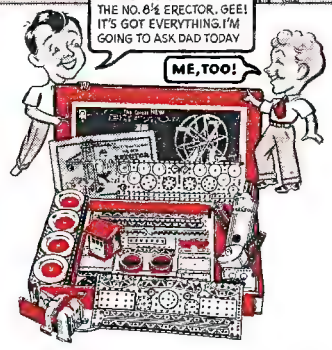
BOYS! Leading toy stores are showing a sensational new kind of Erector this year. An Erector that makes model-building more fun than the movies —more exciting than a football game. Because Erector has gone ALL-ELECTRIC.

Now, for the first time, you can build a revolving airplane beacon with real electric searchlight—construct electrically lighted railroad trains, Ferris wheel, airplanes, motor cars—erect electric bridges that open and close—make mighty cranes that grab up steel girders by electro-magnetic power.

You can build all the engineering marvels you see on this page—and 100 more—with ONE Erector Set. Put dazzling electric lights on them. Make them buzz with action with the new 4-speed Erector electric engine. There are more blood-tingling thrills in the new All-Electric Erector than in a dozen ordinary toys. Tell Dad that Erector is your No. 1 choice of Christmas presents.

The Sensational New ALL-ELECTRIC

ERECTOR



Get a load of the sensational new No. 8½ Erector. Crammed with exciting electrical and structural parts. Electric lights—110 volt electric engine with 4 speeds and automobile-type gear shift—powerful electro-magnet. Also, polished steel boiler shell—big red wheels—steel girders and structural plates—gears and pinions—a total of 18 lbs. of parts for building over 100 colossal, engine-driven, electrically lighted engineering marvels. Price $12.95; other Erectors from $1.00 to $27.50.

A Christmas gift from A. C. Gilbert, the inventor of Erector! The Mysterious Erectorscope. Brings you sights so amazing you can scarcely believe your own eyes. *Free* with catalog of New All-Electric Erectors.

Free!

RUSH COUPON OR 1¢ POST CARD

Mr. A. C. Gilbert,
Gilbert Hall of Science,
27 Erector Square,
New Haven, Conn.

Quick! I want one of your Mysterious Erectorscopes and advance catalog on your new All-Electric Erector. Rush both FREE.

Name .....

Street .....

City ..... State .....

Now is the Time to ...Get Into AVIATION Train at LINCOLN

AVIATION CALLS YOU TO GOOD PAY JOBS!

Bill Burgess, the Pilot pictured below, trained at **LINCOLN.** Now he pilots his plane all over the country in aerial mapping service. Travel, adventure, good-pay . . . these are Bill's reward for Training at Lincoln . . . a Government Approved School.

Be a PILOT, MECHANIC or an AERONAUTICAL ENGINEER

Lincoln Training has helped hundreds to reach success in Aviation. It can help **YOU** prepare for a good position as Licensed Pilot, Mechanic or as Aeronautical Engineer. Learn to fly many types of modern airplanes; to overhaul and repair modern airplanes and engines; assist our Engineers in designing and building real airplanes. **GOOD POSITIONS and GOOD PAY** in Aviation. Our Lincoln Graduates regularly taking positions. We train you and assist Graduates in locating positions. We furnish Board and Room for part-time employment while in training. **MAIL COUPON TODAY for complete information.**

LINCOLN AIRPLANE AND FLYING SCHOOL
5012 Aircraft Bldg., Lincoln, Nebraska

I'd certainly like to get into Aviation. Please send complete information about Lincoln Training.

Name _____

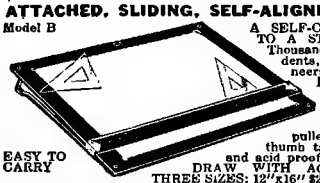
Address _____

City _____ State _____

NEW MODEL **DRAW-O-MATIC** DRAWING BOARD

ATTACHED, SLIDING, SELF-ALIGNING, PARALLEL-BAR

Model B



A SELF-CONTAINED UNIT BUILT TO A STANDARD OF QUALITY. Thousands in use by Draftsmen, Students, Architects, Artists, Engineers, Designers and Executives. Hard composition board stays flat. Light weight. Barslides accurately and easily. Patent CROSS-STRUNG bronze cable and pulley give accurate action. No thumb tacks necessary. Water, oil and acid proof. ENABLES ANYONE TO DRAW WITH ACCURACY AND SPEED. THREE SIZES: 12"x16" $2.95, 16"x20" $3.95, 20"x25" $4.95 plus postage. Other models with transparent celluloid straight-edge described in FREE CIRCULAR. WRITE TODAY.

EASY TO CARRY

ROLLIN INSTRUMENT CO. Inc., Dept. MX-128, 216 No. Clinton St., Chicago, Ill.

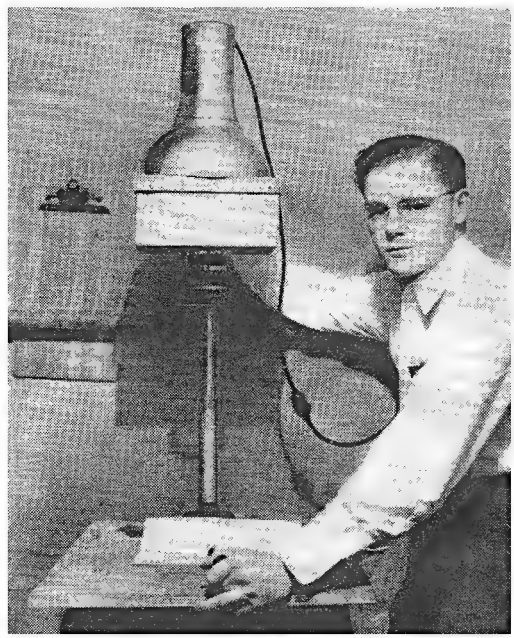
GIVE ME 7 DAYS TO PROVE I CAN MAKE YOU A NEW MAN—

I changed myself from a 97-lb. weakling to winner of title, "World's Most Perfectly Developed Man." Let me prove—in 7 days—that my secret of **Dynamic Tension** will make a NEW MAN of YOU—give you glowing health, smashing strength—banish constipation, bad breath, pimples. Thousands praise my natural method. Write for FREE BOOK of actual photos. CHARLES ATLAS, Dept. 612, 115 E. 23rd St., New York City.

SEND FOR MY FREE BOOK

Editor's Workbench Chips

[*Continued from page* 14]



Amateur photography fan Leonard L. Bass sent in this photo of himself with the enlarger he constructed from MI plans.

engine, the tiny car speeds along at 45 m.p.h. and averages 40 miles per gallon of gas, according to Bill. Three forward speeds, an electric starter and front mud guards that turn with the wheels are features of the racer which has a wheel base of 60 inches and a tread of 30½ inches. It's a nice looking job, Bill. Good luck with it.

***

Another amateur photography fan who sent in a photo that was awarded $3 is Leonard L. Bass of New York, N. Y. Leonard built an enlarger from plans that appeared in MI and says that the results have been excellent. Nice work, Leonard, and I'm glad you posed with the enlarger as we like to feature photos of projects with the builders standing by. Thanks, also, for your kind words about MI. We are glad to know that you find the magazine "swell" every month.

***

Be sure you read the details of the big "Men With Wings" aviation contest which appear on pages 78-79. The contest features 23 excellent prizes consisting of miniature gasoline motors, gas model plane kits and a round-trip airline flight to Hollywood, Calif.

[*Continued on page* 18]

You Ask Me What I Am Doing?

I Am Getting Ready to Earn More Money . . . Preparing for a Bigger Job

I am a student of the American School, Chicago. A little more than half way through my course—already my increased knowledge has brought me promotion as a result of the hour or so a day I have been spending getting acquainted with the principles of the work I enjoy. I use only part of my spare time, so it doesn't interfere with my home and social life, and certainly helps me on the job.

I have been surprised at the practical manner in which even advanced work is explained. It is a lot easier than I had expected. I only wish I had started this plan of getting ahead a few years earlier. But when I was 18 to 20 I felt pretty sure of myself. I didn't take enough stock in what more experienced people told me about the importance of being thoroughly trained for the job I wanted.

You Can't Win If You Don't Try

American School, Dept. G928, Drexel Ave. at 58th St., Chicago

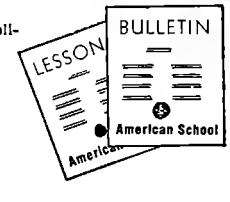
CUT ALONG THIS LINE

Try a Lesson Yourself—No Obligation

American School, Dept. G928, Drexel Ave. at 58th St., Chicago

I have checked the line of work in which I would like a good job. Please send me without expense or obligation on my part a copy of your Bulletin and an early lesson in the field I have selected.

- ☐ Air Conditioning
- ☐ Architecture
- ☐ Automotive Engineering
- ☐ Automobile Repairing
- ☐ Bookkeeping and Cost Accounting
- ☐ Business Management
- ☐ Civil Engineering
- ☐ Aviation
- ☐ Contracting, Building
- ☐ Electrical Engineering
- ☐ Diesel Engineering
- ☐ Drafting and Designing
- ☐ Electric Refrigeration
- ☐ Heating, Ventilating, Plumbing
- ☐ Professional Accounting Incl. C. P. A. Coaching
- ☐ High School
- ☐ Highway Engineering
- ☐ Law
- ☐ Liberal Arts (College)
- ☐ Mechanical Engineering
- ☐ Merchandising
- ☐ Private Secretary
- ☐ Radio and Television
- ☐ Salesmanship
- ☐ Shop Practice
- ☐ Steam Engineering



Name ---------- ***Age*** ---------- ***Occupation*** ----------

Street ---------- ***City*** ---------- ***State*** ----------

TRAIN FOR ELECTRICITY IN 12 WEEKS HERE IN THE COYNE SHOPS

PAY TUITION AFTER GRADUATION

Mail coupon today for details of my **"Pay after graduation plan"** and famous Coyne **"Learn by Doing"** method of practical shop training for your start for success in this big-pay field. Age or lack of money need not hold you back . . . Get training **first**; then take **18 months** to complete small monthly tuition payments starting **5 Months** after you begin training.

12 WEEKS' TRAINING

Coyne Training is practical, thorough, easy to grasp . . . you learn quickly by doing **actual jobs** on **real electrical machinery right here in my Chicago Training Shops**—NOT from books or printed lessons. You don't need previous experience or a lot of book learning. Expert instructors guide you every step of the way.

EARN WHILE LEARNING—JOB HELP AFTER GRADUATION

Big things ahead in Electricity means opportunities for steady jobs, good pay, and a real future in this fascinating "live" industry. **Thousands of opportunities.** Rush the coupon TODAY for **Big Free Book** containing many photos of the great Coyne Shops in Chicago, facts about Coyne Training . . . Free Employment Service . . . many earn while learning . . . additional instruction in **Diesel Engines, Electric Refrigeration and Air-Conditioning** at NO EXTRA COST and amazing **Pay-Tuition-After-Graduation Offer.**

Learn by Doing

COYNE ELECTRICAL SCHOOL
H. C. LEWIS, President
500 S. Paulina St., Dept. 98-53, Chicago, Ill.

H. C. LEWIS, President, Coyne Electrical School
500 S. Paulina St., Dept. 98-53, Chicago, Ill.

Send me, without cost or obligation, your Big Free Book and details of **Pay-Tuition-After-Graduation-Offer.**

NAME_____

ADDRESS_____

CITY_____ STATE_____

DIESELS

PREPARE FOR TOMORROW'S OPPORTUNITY

This is your opportunity to qualify as a Diesel Engineer. Men with practical training are in demand for good-paying, responsible positions. You can qualify for a place in this rapidly growing industry.

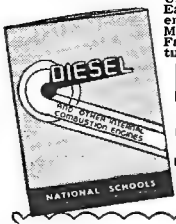
TESTED TRAINING—REAL SHOP EXPERIENCE

Internal Combustion Engines—Automotive Service

National Schools give you actual shop methods. You learn on the latest and best equipment in a million-dollar trade school. You are taught to make good and helped to make good after you graduate. It will pay you to investigate National's Master Course.

FREE!

Transportation Allowed to Los Angeles
Coach railroad fare allowed from any point in the United States.
Earn room and board while learning. Graduate employment cooperation.
Mail coupon for new 40-page Book of Diesel Facts, details of training, employment opportunities.



NATIONAL SCHOOLS
LOS ANGELES

Request for FREE BOOK

NATIONAL SCHOOLS
Dept. MMA12 4000 So. Figueroa St., Los Angeles, Calif.

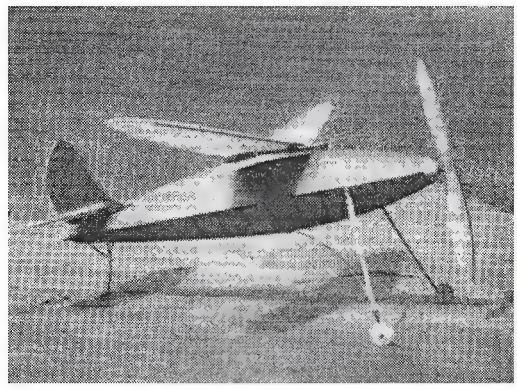
NAME_____ AGE_____

ADDRESS_____

CITY_____ STATE_____

Editor's Workbench Chips

[*Continued from page* 16]



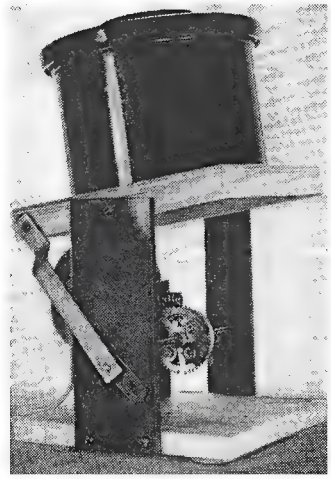
Flights of three to five minutes are reported for this "Cloud Hooker" rubber-powered model airplane which John Vlahakes built from plans that appeared in April, 1937.

Although gas-powered model airplanes have become very popular during the past year, the majority of modelers are still building rubber-powered types. One of the best cabin endurance types ever featured in MI was the "Cloud Hooker" (April, 1937 issue.) John Vlahakes of Birmingham, Ala., built a model from the plans and says that it has repeatedly produced flights of from three to five minutes duration. Your model looks good, John. Watch for MI's $3 check in the mail.

***

Photos of enlargers, driers, and numerous other photography gadgets have been coming in to the Workbench in ever increasing numbers lately. One of the photos received was sent in by Harold Nogle of Port Arthur, Texas, and shows a film tank agitator he built from plans in the July, 1938 issue. Harold used parts from an old Meccano set, an old clock, Bakelite uprights and wooden blocks to build the agitator. Such ingenuity should be recognized, say I, so I'm sending Harold a $3 award.

[*Continued on page* 21]



Following plans that appeared in MI (July 1938), Harold Nogle built this photographic film tank agitator.

DAD...THIS IS REAL ADVENTURE!... MY CHEMCRAFT OUTFIT IS THE BEST PRESENT I EVER HAD!

YES, indeed, a Chemcraft Chemistry Outfit *is* a grand present. Fun? You bet—the greatest fun in the world—real adventure —the thrills of performing hundreds of fascinating and amazing experiments.

But with the fun you can also secure a practical knowledge of Chemistry—the marvel science that has contributed so greatly to industry, medicine and the progress of civilization. From this simple beginning many youngsters have become important figures in scientific and industrial fields.

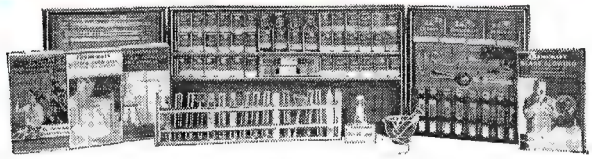
Chemcraft Chemistry Outfits are used in schools and colleges and the Instruction Manuals contain valuable information and describe fully how to perform many interesting experiments. Chemcraft Outfits contain no dangerous substances.

See Chemcraft Chemistry Outfits at your local store, priced from $1.00 to $25.00. If they do not have them you may order direct from us.

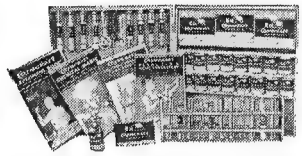
All the thrills and wonders of a real Chemist's Laboratory are yours with

REG. U.S. PAT. OFF.

CHEMCRAFT
CHEMISTRY OUTFITS



Outfit No. 10—Big Lab Style mahogany finished cabinet containing splendid assortment of chemicals and apparatus. Instructions for 730 practical experiments in Chemistry, Electrochemistry, Glass Blowing, and Formulae & Symbols. Price $10.00



Outfit No. 4—395 fascinating chemical experiments including Chemical Magic, Plans for Home Lab. and Chemical Formulae & Symbols. Liberal quantities of chemicals and apparatus packed in convenient laboratory style wood cabinet. Price $3.95

Outfit No. 2—A big value outfit in a stand-up wood cabinet. Contains chemicals, apparatus and directions for 194 thrilling experiments including Plans for a Home Lab. Price $2.00

You'll enjoy this FREE BOOK. Mail Coupon

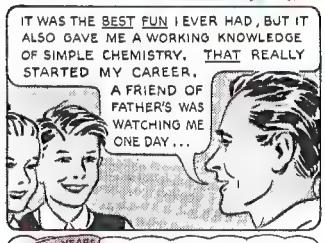
Our new book "Adventures in Science" is a real treasure house of information and entertainment for the young scientist. It is full of astonishing scientific facts, and tells about many thrilling experiments in Chemistry, Microscopy, Physics, Biology, Electricity, etc. Book also helps you to construct a home laboratory, and tells how you may become a member of the Chemcraft Science Club.

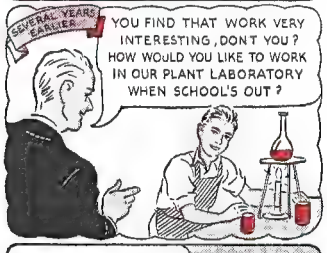
The Porter Chemical Co.
462 Prospect Ave.
Hagerstown, Md.

DON'T MISS SENDING FOR THIS **FREE BOOK** MAIL COUPON TODAY

462 Prospect Ave., Hagerstown, Md.
THE PORTER CHEMICAL COMPANY
Please send me your free book "Adventures in Science".

Name .....
Address .....
City .....
State .....

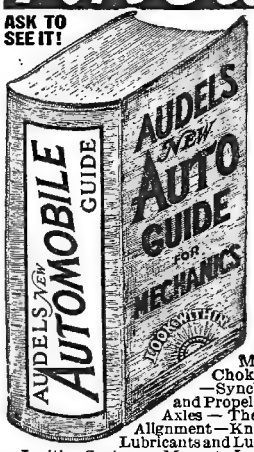

IT WAS THE BEST FUN I EVER HAD, BUT IT ALSO GAVE ME A WORKING KNOWLEDGE OF SIMPLE CHEMISTRY. THAT REALLY STARTED MY CAREER.
A FRIEND OF FATHER'S WAS WATCHING ME ONE DAY...


SEVERAL YEARS EARLIER...
YOU FIND THAT WORK VERY INTERESTING, DON'T YOU? HOW WOULD YOU LIKE TO WORK IN OUR PLANT LABORATORY WHEN SCHOOL'S OUT?

I'VE BEEN HERE SEVERAL YEARS NOW, AND THEY'VE JUST MADE ME ASSISTANT TO THE MANAGER
THAT'S WONDERFUL, I'M GOING TO ASK DAD TO GIVE ME A CHEMCRAFT OUTFIT FOR CHRISTMAS.

Know! YOUR CAR

ASK TO SEE IT!



GOOD NEWS—JUST OUT

1938 AUDELS NEW AUTOMOBILE GUIDE is NEW from cover to cover. Explaining the Theory, Construction and Servicing of modern motor cars, trucks and buses; and the application of auto type Diesel Engines. . . . **PRACTICAL INFORMATION IN HANDY FORM, 1540 PAGES COVERING . . .**

AUTO REPAIRS & SERVICE HELPS

All the Parts of an Automobile—Automotive Physics—The Gas Engine—How a Gas Engine Works—Gas Engine Principles—Multi-Cylinder Engines—Horse Power—Automobile Engines—Engines: Stationary Parts—Engines: Moving Parts—Pistons—Piston Rings—Connecting Rods—Crank Shafts—The Valves—The Valve Gear—Cams and Cam Action—Valve Timing—Cooling Systems—Gasoline—Fuel Feed Systems—The Mixture—Carburetors—Automatic Choke—Super-Chargers—Transmissions—Synchro-Mesh—Clutches—Universals and Propeller Shafts—The Differential—Rear Axles—The Running Gear—Brakes—Wheel Alignment—Knee Action—Steering Gear—Tires—Lubricants and Lubrication—Automotive Electricity—Ignition Systems—Magneto Ignition—Spark Plugs—Ignition Coils—Distributors—Automatic Spark Control—Ignition Timing—Generators—Starters—Generator and Starter Testing—Lighting Systems—Storage Batteries—Battery Charging—Battery Testing Troubles. **Automotive Diesel Engines. Inside Views of all Automobile Parts Fully Illustrated. To Get This Assistance for Yourself Simply Fill In and Mail Coupon Today.**

$4 COMPLETE • PAY ONLY $1. A MONTH ←

THEO. AUDEL & CO., 49 WEST 23rd STREET, NEW YORK

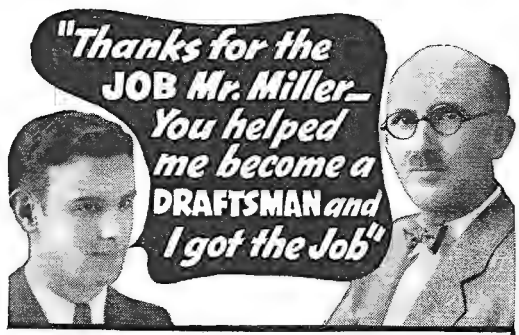
Please send me postpaid AUDELS NEW AUTOMOBILE GUIDE ($4) for free examination. If I decide to keep it, I will send you $1 within 7 days; then remit $1 monthly until purchase price of $4 is paid. Otherwise, I will return it to you promptly.

Name _____

Address _____

Occupation _____

Reference _____ MM12



Thousands of letters like this have been written to prove that **DRAFTING,** learned the American School way, **DOES PAY.** Here's work you will enjoy, for it's great to see some huge plant or immense building taking shape on the drawing board and the draftsman expects **STEADY WORK** for he is usually among the **first to be hired** and the last to be laid off. Why not get into drafting—have a profession instead of a trade?

Be a Draftsman—

Learn at home We train you thoroughly and expertly in the half hours you can spare from work or pleasure.

No need to burn midnight oil. Go as slow or as fast as your time will permit. Lessons are so clearly written that beginners can easily understand them and our system of **"practice study"** adds **EXTRA VALUE** to the instruction.

Use head and hands in this fascinating profession, to make **more money** and put yourself in line for promotion.

Write for **FREE** bulletin—there is no obligation of any kind.

O. C. MILLER, Secretary

AMERICAN SCHOOL

Dep't. DD928, Drexel at 58th Chicago

LAW STUDY AT HOME

Legally trained men win higher positions and bigger success in business and public life. Greater opportunities now than ever before. Big corporations are headed by men with legal training.

More Ability: More Prestige: More Money

We guide you step by step. You can train at home during spare time. Degree of LL. B. Successful graduates in every section of the U. S. We furnish all text material, including 14-volume Law Library. Low cost, easy terms. Get our valuable 48-page "Law Training for Leadership" and "Evidence" books FREE. Send for them NOW.

LaSalle Extension University, Dept. 12493-L, Chicago
A Correspondence Institution

BILD-UR-OWN

COASTERS • MIDGET AUTOS • SCOOTERS • BIKE TRAILERS, ETC

BIG SAVINGS ON EVERY THING YOU NEED

NEW ROADSCOUT Scooter Complete **$59**

Equip your Scooter, Midget car, etc. with our Disc Wheels and Balloon tires.

GOODRICH-GOODYEAR-FIRESTONE

at lowest prices. We specialize in wheel sets, scooter kits, motors, parts, etc. Send 10c to cover cost of mailing book and Free Plans.

BILD-UR-OWN DEVICES, 5237 Lake St., Dept. B-12, CHICAGO, ILL.

Home Study

EARN A DEGREE AT HOME

Home Study Courses leading to Degrees in Arts; Sciences; Philosophy; Education; Public Health; Psychology; Sociology; Physics; Chemistry; Geology; Pol. Science; Theology; Law; Agriculture; Business Training; Accounting; Statistics; Adv.; Sales; Electrical, Civil, Mechanical, Drafting, Architectural, Automotive, Steam, Diesel, Aeronautical, Radio, Structural, Mining, Industrial, Highway, Petroleum, Marine, Refrigeration, Air Conditioning, Chemical Engineering. Founded 1908. Chartered.

McKinley-Roosevelt Graduate College, 4208 Clarendon Ave., Chicago

LEARN

YOU TEACH YOU AT HOME
LET US!

NEW COURSE **SIGNS** SHOW CARDS EASY TO LEARN
POSTER AND ALL FREEHAND LETTERING

EARN

Write Dept. A
REGINA SCHOOL OF LETTERING
77 W. Washington St., Chicago, Ill.

RADIO

ENGINEERING, broadcasting, aviation and police radio, servicing, marine radio telegraphy and telephony. Morse telegraphy and railway accounting taught thoroughly. Engineering course of nine months' duration, equivalent to three years of college radio work. School established 1874. All expenses low. Catalog free.

DODGE'S INSTITUTE, Fern Street, Valparaiso, Indiana

205 WAYS TO MAKE MONEY!

Send for FREE Booklet!

K. cleared $192. weekly. Exceptional, but you might equal or surpass. Start your own business from home, office, etc. Free Booklet describes Collection of 205 Money-making Plans, today's conditions. Write Now!

STAMFORD CO.,
3762-H Broadway, New York

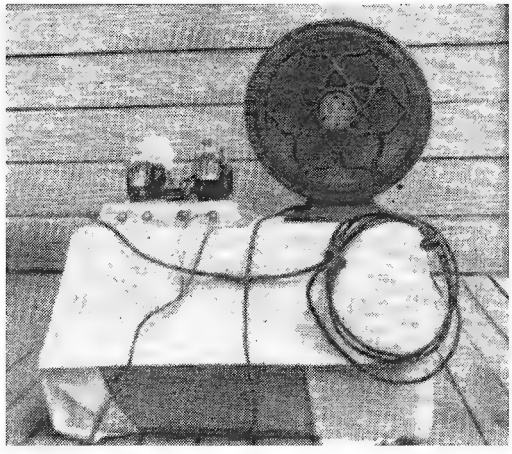
BIG NEWS FOR MODELBUILDERS & HOMECRAFTSMEN

in the values and prices featured in the great new C-D Handbook Catalog—now ready! Bargains galore. Thousands of items—including 135 world-famous C-D flying model airplanes; also other makes, 10c up. Also O, CD, OO and HO gauge model RR equipment, and toy trains at 20c up. Gas model airplanes, and all well known gas engines; hand tools, power machinery, ship kits—and all necessary supplies. Microscopes, etc. Nothing ever before like it. Edition limited, so act at once. All for only..... **10c**

Cleveland Model & Supply Co., Inc., 4508-B82 Lorain Ave., Cleveland, Ohio

Editor's Workbench Chips

[*Continued from page* 18]



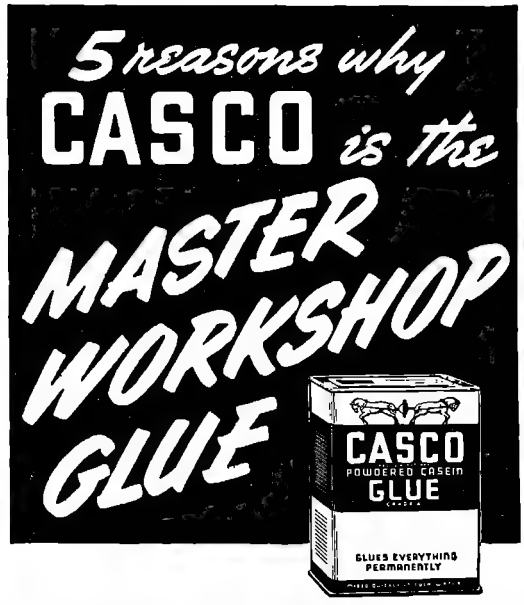
Frank La Verne McMarman assembled this novel "cake tin" all-electric radio amplifier, following plans in a 1935 issue.

According to official reports there are about 55,000 licensed radio amateurs in the United States, with probably four times as many "serious" short-wave listeners. Judging from the letters and photos received by the Workbench, many of these radio fans are readers of MI. For instance there's Frank La Verne McMarman, who sent in the photo of the "cake tin" all-electric amplifier which he constructed from plans that appeared in the August, 1935 issue. Frank says he has used MI plans for years and has always had satisfactory results. Unfortunately, Frank, you neglected to send your street address, so I'll have to hold MI's award of $3 for you until you correspond with me again.

While on the subject of radio, the January issue will include complete plans for the construction of a receiver that we think is just about the best we have ever heard. Designed for listeners who are more than just particular about how their set sounds, this outfit really gives high-fidelity reproduction. The best part of the receiver is its simplicity. Anyone can build it and the cost is less than you would expect.

It uses the latest tubes and a circuit that has had all the "bugs" ironed out so that when you build it, it will work! Everyone who has heard it is surprised that a radio of such unusually high-fidelity reproduction, can be built for such low cost. It's not very often that we become excited about a radio set, but when we heard this one, we knew that MI readers, and the radio fans in particular, would want to build this set. Don't miss the January issue, for complete details.

[*Continued on page* 31]



1. WEATHERPROOF BOND. A different kind of glue, CASCO sets *chemically* like concrete, forms an insoluble bond that resists both heat and moisture.

2. UNIFORM STRENGTH. Processed by laboratories with 30 years' experience in adhesives, CASCO has been proven on many of industry's toughest gluing jobs. Get this strength for *your* gluing... insist on "CASCO Powdered Casein Glue".

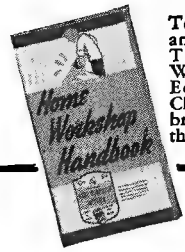
3. USED COLD. CASCO spreads easily, sets at full strength *without heating!* Use it outdoors, indoors, anywhere, any time.

4. EASY TO MIX. No mess. Just add water to enough CASCO for the job—no waste. Quickly forms a smooth, creamy mix.

5. ECONOMICAL. You get CASCO in powder form, *all glue*... no liquid preservatives. 1 lb. of CASCO makes *1½ quarts* of full strength glue for *65c!*

10c TO 65c AT HARDWARE, PAINT AND LUMBER DEALERS

FREE—New kind of Home Workshop Handbook



Tells how and where to get free and low-cost expert advice on Tools, Free Plans, Finishes, Woods, Veneers, Sharpening Equipment, Home Workshop Clubs, etc. The *first* handbook to bring you *all* this information. Send the coupon for your copy, now.

CASEIN COMPANY OF AMERICA
350 Madison Ave., Dept. MI-1238
New York, N. Y.

Yes, send me your free "Home Workshop Handbook"

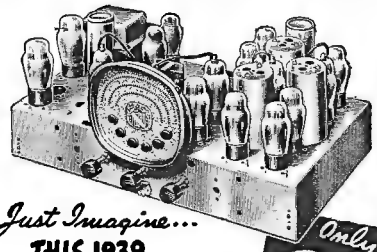
Name_____

Address_____

Save 2c, stick coupon on penny postcard

FACTORY-TO-YOU SAVES YOU UP TO 50%

WORLD'S GREATEST RADIO VALUE!

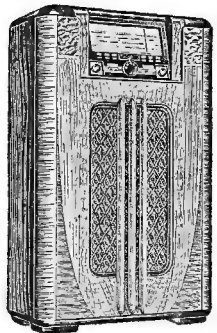


Just Imagine...

THIS 1939

15-TUBE WORLD-WIDE MIDWEST

Only $29.95 WITH TUBES AND SPEAKER



30 DAYS FREE TRIAL

It's Easy to Install This Chassis in your Old Radio

MODERNIZE your old radio by putting this big, new, powerful 15-tube chassis in your present cabinet—and make your radio dollars go twice as far. Just imagine—15 tubes at the price of an ordinary 10-tube set! Exciting world-wide reception. Sensational new features. Midwest makes a radio to fit every purse. They are bigger, better, more powerful, more luxurious—and just sparkle with new features. (Only $76.75 for the Super DeLuxe 17-tube 5-Band Console shown here.)

BIG TRADE-IN ALLOWANCE*

You save 50% and make your radio dollar do double duty when you order direct from the Midwest factory. In addition, you secure $30.00 or more trade-in allowance on your old radio (on some radios). Easy payments. Enjoy 30 days' FREE trial in your own home. Money-back guarantee. Send penny post card or write for new FREE 1939 catalog.

MIDWEST RADIO CORPORATION
Dept. 10-FF, Cincinnati, Ohio

Paste coupon on 1c postcard . . . or write today!

MIDWEST RADIO CORPORATION
Dept. 10-FF
Cincinnati, Ohio

Send me your new FREE catalog, complete details of your liberal 30-day FREE Trial offer, factory-to-you wholesale prices and big TRADE-IN offer.

Name _____

Address _____

Town _____ State _____

User-Agents Make Easy Extra Money. Check here ( ) for details.

NEW BENJAMIN AIR PISTOLS WITH MULTIPLE LEVER HAND PUMP FOR TARGET-SMALL GAME-CAMPING-ETC.

WRITE TODAY!

Guaranteed - Accurate - Practical-Economical-Safe-Clean-Quiet. Adjustable Force-Amazing Maximum Velocity. No smoke or fumes. **Bolt Action-Hammer Fire-Hair Trigger-Safety Lock-Hand Pump.** Single Shot BB $3.50; Single Shot cal. 177 or 22 with rifled barrel $5.50; BB 8-Shot $10.00; Holster $2.00. **Also a complete line of Benjamin Genuine Compressed Air Rifles** for BB and cal. 177 or 22. No license required-from dealer or factory. **Ask for complete specifications and Free Targets. BENJAMIN AIR RIFLE CO., 830 Marion St., St. Louis, Mo., U. S. A.**

Harvard Scientists Analyze Tones Of Old, New Violins

Tomorrow's violin makers, turning out rich-toned instruments on a quantity basis, may be able to make violins rivaling famous old Stradivarius and other instruments as the result of a study under way at Harvard University in Cambridge, Mass.

Prof. Frederick A. Saunders, in charge of a research group comparing the behavior of 30 instruments ranging from a five-dollar fiddle to some of the finest violins known to the world of music, has found that inexpensive modern violins at some notes have approximately the same tone quality as the averaged responses of several Stradivarius violins.

The discovery offers considerable hope that scientific design may enable the construction of relatively cheap instruments with the fine tones of the old masters' violins.

The beautiful, vibrant tones of the world's most precious violins are being analyzed and compared with the harsher notes of the typical pawnshop fiddle in the research project.

Dr. Saunders has also found a striking similarity between the averaged responses of five Strads and five other fine old Italian instruments made by P. Guarnerius, J. Guarnerius, Stainer, Guadagnini and Gagliano. Further research is expected to shed light on whether there is a unique "Italian tone" which many musicians believe to be characteristic of violins by Stradivarius and other noted makers.

Tests are also in progress to discover any physical changes in violins which might explain the raw tone found in many new instruments and which disappears after a few months of playing. Prof. Saunders believes it may be due to the tight gluing of the wood which prevents the instrument from vibrating freely. This glue loosens with use, he believes.

Key apparatus in the tone analysis research is a "sound camera" which automatically makes a picture of tones up to 10,000 cycles, well beyond the upper limit of the musical scale. While the ear hears a musical note as a vibration at one particular frequency, the note is actually the result of simultaneous vibrations at several frequencies. The sound analyzer, built by Dr. Harry H. Hall, with the cooperation of Prof. Frederick V. Hunt and Prof. George W. Pierce, separates these partial tones and measures their relative intensities.

Tests are also under way concerning the contribution to the violin tone of some of the body parts, especially the bridge and the internal air mass.

Virtually none of the tone comes from the strings, but chiefly from the reactions of the complex vibrating system of the violin body and the internal air mass to the string vibrations.

NOW! Anyone without experience can do a thousand and one REPAIR JOBS!

WELDING BRAZING SOLDERING

QUICKLY PERFECTLY EASILY with the NEWLY INVENTED 3 IN 1 Electric TORCH

Complete With Power Unit—Works Off 110 Volt AC or DC Light Circuit

Here at last is a portable machine that does real welding, brazing and soldering, yet is priced within the reach of all. The 3 in 1 comes to you complete with goggles, carbons, various types of welding rod and all accessories needed to do various repair jobs. It is all ready to plug in a light socket—nothing extra to buy. Simple instructions make it possible for you to do first class work easily without any previous experience or mechanical skill. The 3 in 1 instantly creates a terrific flame by just touching the carbons together.

Repairs Fenders, Auto Bodies, Tanks, Bicycles, Radios, Etc.

The 3 in 1 is ideal for auto body repairs and fender weld jobs—steam fitters, plumbers, sheet metal shops, engineers, maintenance men and janitors will find it indispensable. By following simple instructions, heavy work such as bumpers, tanks and industrial repairs can be done. Ideal for the countless jobs around a home or farm. WORKS ON ALUMINUM, BRASS, COPPER, IRON, STEEL AND OTHER METALS.

AGENTS! You will find quick easy sales waiting for you in repair shops, garages, factories, sheet metal, radio and bicycle repair shops, and many other places. Write at once for free particulars and learn how you can get your own 3 in 1 Electric Torch absolutely free for demonstration purposes by helping to introduce it to others.

ELECTRO-TORCH CO., 2613-BK, Michigan Ave., Chicago, Ill.

SAVE THAT OLD TIRE

Amazing new plastinoid "putty"—**SO-LO** —fills cracks, holes in old tires, shoes, boots—anything of rubber, leather or cloth. Spreads on like butter. Dries tough, overnight. Waterproof, flexible, non-skid. Won't come off—guaranteed! 25c package (25 repairs) shows many uses. Get **SO-LO** at any 10c or hardware store.

ONLY 1¢ **So-Lo**

TRIAL LESSON IN Free • DRAFTING

More good jobs now in Drafting. Learn AT HOME in spare time (or at our Chicago School). Send post card for **FREE TRIAL LESSON** and see how easy to learn and get a good job.

CHICAGO TECHNICAL COLLEGE
S-263 Tech. Bldg., 118 E. 26th St., Chicago, Ill.

WIND DRIVEN Electric PLANT

Build Your Own—We Show You How

Make auto generator light buildings, play radio, run washing machine and other motors from FREE WIND POWER. Earn money making for others. Dime brings complete building plans and 1938 catalogue listing over 500 windcharger electrical items. Most complete windcharger catalog; welders, electric fence, etc., over 100 other generator changes into 6-12-32 and 110 volt plants.

LEJAY MFG. CO., 414 LeJay Building, Minneapolis, Minn.

"QUICK ACTION" (1938) PERFECTED AUTOMATIC GAS LIGHTER

450% Profit. We pay P. P. Charges
$1.00 a Dozen. Rush 10c For Sample and Selling Plan

Enameled Streamlined Wood Handles
Packed on Individual Cards.
Write today. New Method Mfg. Co., Desk MG-72, Bradford, Pa.

12 Dozen $8.00
Net Profit $28.

How To Secure A Government Position

Why worry about strikes, layoffs, hard times? Train now for a Government job. Increased salaries, steady work, travel, good pay. Let us help you become a Railway Postal Clerk, Post Office Clerk, City Mail Carrier, Rural Carrier—help you get a position in Government Classified Service. I was a Civil Service Examiner for nearly 8 years. This coaching has helped thousands. Big illustrated book tells about Government jobs and how our instruction helps to qualify you to get the one you want. Send for a free copy TODAY.

FREE BOOK

PATTERSON SCHOOL, Arthur R. Patterson
(Former Gov't. Examiner) Principal,
4312 Mercantile Bldg., Rochester, N. Y.

Send without obligation, free book "How to Secure a Government Position."

Name .....

Address .....

AGENTS MAKE UP TO $50.00 IN A WEEK with this Case!

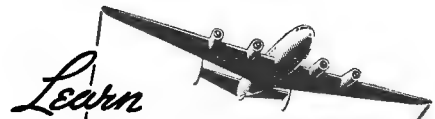
FORD CARS GIVEN

Own a big-paying route. No money risk. Supply your customers weekly with necessities—groceries, drugs, cleaners—proven fast sellers. Steady repeat business. Big profits first day.

I'll give you a brand-new Ford Sedan as a bonus for producing.

I send Complete Outfit and quick cash Plan. Send no money—just name on penny postcard for free details. **Do it NOW!**

ALBERT MILLS, Pres.
6523 Monmouth Ave., Cincinnati, O.



Learn AIRPLANE DESIGNING

Train at home for a position in this vital branch of aviation with specialized courses prepared by leading Engineers now employed by major aircraft factories. Step out of the jack-of-all-trades class. Specialized Aero Drafting, Layout and Design lead to ranking Engineers positions. You can start this training without previous experience, and only simple arithmetic is required. Other advanced courses in Stress Analysis and Electrical Engineering. Check and mail this advertisement today for free booklet, "Specialized Application Brings Greater Success" **Dept. I-12**

WESTWOOD *Correspondence School*
VILLAGE STATION
LOS ANGELES, CALIFORNIA

☐Aero Drafting ☐Designing ☐Stress Analysis ☐Electrical Engineering

BE A RAILWAY TRAFFIC INSPECTOR

Help Yourself to Success . . . this Winter

Give a few weeks' spare time to our home-study Course on *Railway and Bus Traffic Inspection.* Splendid opportunities for our trained graduates, whom we place at up to $135 per month, plus expenses, to start, *or refund tuition.* Men—19 to 50 eligible. Get the facts. Write **STANDARD BUSINESS TRAINING INSTITUTE, Div. 6112, Buffalo, N. Y.**

"ALNICO" POWERFUL, PERMANENT MAGNETS HORSESHOE or BAR

Newest aluminum, nickel and cobalt steel alloy. Horseshoe **LIFTS 50 TIMES OWN WEIGHT.** Useful, interesting, startling and practical experiments. Set of 2 will permit experimentation with all properties of permanent magnets. HORSESHOE $1.00 ea. BAR (set of 2), $1.50 Sent Postpaid. No. C.O.D. or stamps

Interesting Catalog, 10c

HARRY ROSS
Scientific and Laboratory Apparatus
84 West Broadway, N. Y. City

WHY RENT A BOAT? MAKE YOUR OWN
Even a child can build at least one of the many boats that are described in the big new 148-page book, "How To Build 20 Boats"—1938 Edition. Send 50c for your copy, now.
MECHANIX ILLUSTRATED PUBLISHING CO.
Fawcett Bldg. Greenwich, Conn.

BIG MONEY from POULTRY

I show you how to increase profits, or start your own business. I train you at home in spare time. I show you latest methods. Give you facts that can be worth money to you, or to an employer already established in some branch of the poultry business. Men and women in small towns or suburbs will be particularly interested because latest scientific methods may mean extra profits for them. My home study course used by thousands. 32-page book, "How to Raise Poultry for Profit" comes to you FREE. Mail coupon today.

SCIENTIFIC POULTRY RAISING

HARRY M. LAMON, Pres., National Poultry Institute
Dept. 138-D, Adams Center, N. Y.
Please send me your FREE Book about poultry raising and facts about your course.

Name _____

Address _____

City (R.F.D.) _____ State _____

Air Conditioning Become An Engineer

Big fast-growing field for men trained in design, estimating, insulating, installing and servicing. Offers real opportunities in Air Conditioning new buildings and remodeling worth-while old buildings. Write today for method of how you can prepare for this thriving industry. No obligation.
American School, Dept. AC 928, Drexel at 58th, Chicago

BUILD THE *CUTTY SARK*

2 FT. MODEL OF THE FAMOUS CLIPPER SHIP

Complete Kit makes perfect building easy. **$2.50** plus 15¢ postage

Everything . . Including CARVED WOOD HULLS, Printed Sails, Decks, Cast-Metal Lifeboats, Anchors, Bitts, Steering Wheel, Chains, Masts, Spars, Rigging, Cement, Colored Lacquer — Full-Size Plans and Instructions.

Send for Catalog *all* Ideal's new Models - 10¢
IDEAL AEROPLANE & SUPPLY COMPANY, INC.
22 West 19th Street

Radio-Electrical EXPERIMENT KIT

Only $3.99 — 6 Books FREE

THRILLING! EDUCATIONAL!
25 UNITS genuine salvage commercial apparatus with fine experimental manual! BUILD radio circuits, 110-volt AC motor, eaves-dropping phone, thief detector, powerful arc light, ultra-violet rays, arc furnace, scores more! Used world-wide! Learn at home! **SEND ONLY $3.99** for Special Deluxe Kit and 6 FREE fine electrical Radio books. Books alone worth $3.00! Sent C. O. D. if desired. Stamp brings Bargain Catalog!

ELECTRICAL SALVAGE CO., Box 524-I12, Lincoln, Nebr.

CASH IN ON YOUR SPARE TIME 300 WAYS TO MAKE MONEY

BRAND NEW BOOK—68 PAGES, 40,000 WORDS IN TEXT! "CASH IN" has ALL real money-makers—dozens of profitable tested mail-order plans, confidential business secrets, practical tested formulas, successful tested schemes—actual experiences of men who started on a shoestring with less than $10. A GOLD-MINE FOR ALERT MEN AND WOMEN.

25¢ a copy. *Remit by coin or U. S. stamps. Sent* POSTPAID. MONEY BACK *if not satisfied.*

NATIONAL PLANS INSTITUTE 246-B FIFTH AVENUE NEW YORK, N. Y.

LES — AD ASTRA PER ARDUA

Correspondence Courses In RADIO and ELECTRICAL ENGINEERING

SPECIAL Only $25

ELECTRICAL ENGINEERING Get good grasp of whole electrical field. Prepare yourself, at Low Cost, for secure future. Modern course. So simplified anyone can understand quickly.

RADIO ENGINEERING Extra fine course in radio, public address, photo-electric work. Trains you to be super-service man, real vacuum tube technician. Experimental kits furnished. Diploma given on completion. Tuition, ONLY $25, either course. Deferred payment plan available.

FREE! Send name quick for free copies of school catalogs student magazines, complete details. SEND NOW.

LINCOLN ENGINEERING SCHOOL, Box 931-112, Lincoln, Nebr.

PLASTEX

The Plastex Industry needs manufacturers on small scale and for big production of Art Goods, Novelties, Souvenirs, etc., in Plastex and Marble Imitation. Experience unnecessary. Equipment and simple instructions furnished for speed production. Small investment brings big returns. Nation-wide demand for these low priced goods. Ambitious men have chance for real prosperity. Our free book will interest and benefit you. Big wholesale season now starting. **PLASTEX INDUSTRIES, Dept. 3, 1085 Washington Ave., New York, N. Y.**

Automobile Racing Book (Fourth Edition)

Nine chapters, 66 illustrations of dirt, midget, and championship cars and drivers. How to build cars and bodies; 14 plates working drawings. Ford V-8 front drive racer illustrated and described. Book answers questions on speeding up cars, balance, speed revs., rules, specifications, track records, etc. Postpaid $1.00; C.O.D. $1.15. Order NOW!

RAY F. KUNS, Dept. A-24
Madisonville, Cincinnati, Ohio

Hobby Crafts To Be Shown At Golden Gate Exposition

Hobby crafts will come into their own at the 1939 Golden Gate International Exposition on San Francisco Bay.

At the $50,000,000 World's Fair of the West an unique exhibit of all the tools used in the various home crafts will be displayed. Millions of visitors will be made acquainted with the highly specialized tools and equipment required by amateur craftsmen. Individual tool displays of leather working, wood working, miniatures and models of boats, trains, locomotives and airplanes are planned.

A display of small hand metal working tools promises to be popular, particularly among women who are fast becoming interested in this fascinating craft. Another class of home craft which is rapidly developing is amateur lapidary work. There have been dozens of societies formed all over the country that make a hobby of cutting and polishing stones which the members have actually found. The exhibit will include a complete display of the tools of the lapidist and jeweler both amateur and professional. C. W. Marwedel, representing more than two thousand manufacturers, will install the display.

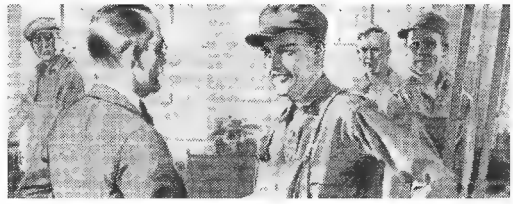
Harvard Scientists Develop Cosmic Ray Counter

A device enabling the fastest and most accurate counts ever made of cosmic rays and other particle radiation has been developed in Harvard University's physics laboratories by Dr. E. C. Stevenson, instructor of physics, and Dr. Ivan A. Getting, junior fellow.

With the new instrument, technically known as a scaling circuit, random electrical impulses coming only a fifty-thousandth of a second apart can be distinguished and counted. The circuit is so stable counts can be made at these terrific speeds for months on end without any effective changes in the equipment

The new scaling circuit does not receive cosmic rays or other particle radiations directly, Harvard physicists pointed out, but rather the electrical discharges produced by these particles in a standard Geiger counter. This is a long glass tube filled with gas at a critical electric equilibrium. A particle passing through the tube upsets this equilibrium to produce an electric discharge.

These impulses are fed into one end of the scaling circuit, where their number is divided by two, four, eight, sixteen or thirty-two, depending on how the apparatus is adjusted. Thus the impulses are scaled down sufficiently to permit their being counted by a plain mechanical counter attached to the circuit outlet.



"THE BOSS DIDN'T EVEN KNOW MY NAME"

"He said he remembered seeing me around, but he didn't even know my name until the I. C. S. wrote him that William Harris had enrolled for a course of home study and was doing fine work.

" 'Who's William Harris?' he asked. Then he looked me up. Told me he was glad I was ambitious. Said he'd keep his eye on me.

"He did too. Gave me my chance when Frank Jordan was sent out on the road. I was promoted over older men who had been with the firm for years.

"My spare-time studying helped me to get that job and to keep it after I got it. It certainly was a lucky day for me when I signed that I. C. S. coupon."

One reason employers recognize the value of I. C. S. training is that many of them are former I. C. S. students. "Today's I. C. S. students are tomorrow's leaders."

In the 47 years since these Schools were founded, more than $5,000,000 has been spent in preparing and revising texts. A personal, individual method of instruction has been developed. Isn't it better to get the facts now — than to wait five years and wish you had?

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 2325-R, Scranton, Penna.

Without obligation, please send full particulars about the subject *before* which I have marked X:

TECHNICAL AND INDUSTRIAL COURSES

☐ Architect
☐ Architectural Draftsman
☐ Building Estimating
☐ Contractor and Builder
☐ Structural Draftsman
☐ Structural Engineer
☐ Electrical Engineer
☐ Electric Lighting
☐ Welding, Electric and Gas
☐ Reading Shop Blueprints
☐ Telegraph Engineer
☐ Telephone Work ☐ Radio
☐ Mechanical Engineer
☐ Mechanical Draftsman
☐ Machinist ☐ Toolmaker
☐ Patternmaker ☐ Boilermaker
☐ Foundry Practice
☐ Sheet Metal Worker
☐ Heat Treatment of Metals
☐ Management of Inventions
☐ Diesel Engines ☐ Aviation Eng.
☐ Auto Technician
☐ Auto Electric Technician
☐ Plumbing ☐ Heating
☐ Air Conditioning and Cooling
☐ Commercial Refrigeration
☐ Steam Engineer
☐ Steam Electric Engineer
☐ Marine Engineer
☐ Civil Engineer ☐ Highway Engineer
☐ Bridge Engineer
☐ Bridge and Building Foreman
☐ Surveying and Mapping
☐ R. R. Locomotives ☐ Air Brakes
☐ R. R. Section Foreman
☐ R. R. Signalmen
☐ Chemistry ☐ Pharmacy
☐ Coal Mining ☐ Navigation
☐ Cotton Manufacturing
☐ Woolen Manufacturing
☐ Agriculture ☐ Fruit Growing
☐ Poultry Farming

BUSINESS TRAINING COURSES

☐ Business Management
☐ Industrial Management
☐ Traffic Management
☐ C. P. Accountancy
☐ Bookkeeping
☐ Secretarial Work
☐ Cost Accountant
☐ Salesmanship ☐ Advertising
☐ Service Station Salesmanship
☐ Business Correspondence
☐ Lettering Show Cards ☐ Signs
☐ Stenography and Typing
☐ Civil Service ☐ Mail Carrier
☐ Railway Mail Clerk
☐ Grade School Subjects
☐ High School Subjects
☐ College Preparatory
☐ First Year College Subjects
☐ Illustrating ☐ Spanish
☐ Cartooning ☐ French

DOMESTIC SCIENCE COURSES

☐ Professional Dressmaking and Designing
☐ Home Dressmaking
☐ Advanced Dressmaking
☐ Foods and Cookery
☐ Tea Room and Cafeteria Management, Catering

Name.....*Age*.....
Address.....
City.....*State*.....
Present Position.....
If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

DO YOU LIKE

RADIO

DOES THE FUTURE OF

TELEVISION

INTEREST YOU?

Send for your free copy

You men anxious to make good in radio and related industries want the true facts,—you want to know about employment opportunities and requirements. National Schools,—a million-dollar trade school,—will supply you with a sincerely honest statement of facts on what you should do to get into the profitable radio industry. No exaggerations,—no mis-statements. Mail coupon today. ¶Send for your free copy. Real facts on radio employment requirements. ¶You need real experience. National offers complete training with modern equipment.

NATIONAL SCHOOLS

Los Angeles

Request for **FREE BOOK of DETAILS**

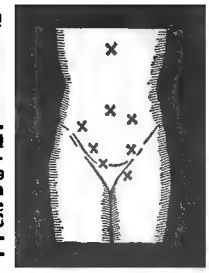
NATIONAL SCHOOLS,
Dep. MMR-12, **4000 S. Figueroa St., Los Angeles, Calif.**

NAME_____ Age_____

ADDRESS _____

CITY_____ STATE_____

Is Your Rupture HERE?

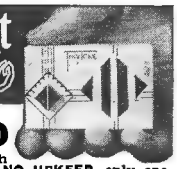


Why delay proper palliative treatment? If you suffer from rupture—and your doctor advises the use of a proper-fitting support—send for the facts about our perfected truss invention —the Brooks Appliance for reducible rupture—with the AUTOMATIC AIR-CUSHION SUPPORT. Thousands bought by doctors for themselves and patients.

Sent on Trial—Made-to-measure, individual fitting for man, woman or child. Low-priced, sanitary, durable. No obnoxious springs or hard pads; no metal girdle to rust. Safe and comfortable. Helps Nature get results. Not sold through stores—beware of imitations. Write today for full information sent free in plain sealed envelope.

BROOKS APPLIANCE CO. 446 State St. Marshall, Mich.

At Last! A WIRELESS TUBELESS BATTERYLESS Pocket Radio



WORLD'S SMALLEST REAL PERFORMING RADIO

Midget radio fits your pocket or purse. Complete in one unit —weighs only 3 ozs. Smaller than cigarette package! Receives stations with clear natural tone. **NO CRYSTALS** to adjust—**NO UPKEEP**—only one moving part. Self contained "Speakophone" unit gives superior performance. **IS NOT A TOY! THOUSANDS OF SATISFIED OWNERS**—Many report amazing reception and distance. Sent complete with instructions for use in home, offices, hotels, boats, Autos, in bed, etc. **TAKES ONLY A SECOND TO CONNECT.** Receives FREE operating power, by wireless, from radio stations.

SEND NO MONEY Pay Postman only $2.99 plus postage on arrival or send $2.99 (Check, M. O., Cash) and yours will be sent postpaid. GUARANTEED. A most unusual value. ORDER NOW!

TINYTONE RADIO CORP. Dept. M-12, **KEARNEY, NEBR.**

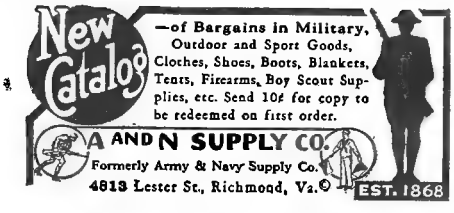
M.M. Earned $1174 at Home!

Earn Cash at Home!

We paid M. M. $1174 for exceptional "cellar crop" SNOW-KING mushrooms! Big free picture book tells if your cellar, shed, barn, suitable. We furnish materials, buy all crops through our 25 branches. Write today for "Guaranteed Success Plan" backed by $5000 bond. Est. 1908.

UNITED MUSHROOM CO.
3848 Lincoln Ave., Dept. 315, Chicago.

New Catalog



—of Bargains in Military, Outdoor and Sport Goods, Clothes, Shoes, Boots, Blankets, Tents, Firearms, Boy Scout Supplies, etc. Send 10¢ for copy to be redeemed on first order.

A AND N SUPPLY CO.
Formerly Army & Navy Supply Co.
4813 Lester St., Richmond, Va. EST. 1868

MECHANICS-WELDERS - COLLISION MEN

Big pay jobs for trained men in Auto and Diesel Mechanics, Electric Arc and Acetylene Welding. Complete courses. Practical training. Short courses in body and fender bumping, spray painting, metal finishing. Fine equipment. Special low rates. Pay-after-graduation-plan. Write today.

MICHIGAN TRADE SCHOOL
3763 Woodward Ave., Detroit, Mich.

Write for FREE FOLDER

Industry Needs MECHANICAL ENGINEERS

Big opportunities for men with Engineering training. Promote yourself by preparing for jobs as Engineer, Superintendent, Master Mech., Factory Eng., Chief Draftsman, Gen'l Foreman. You mechanically employed men don't have to change lines to win promotion, but do have to get ready for jobs ahead. Write today for method for preparing for this well-paying profession. No obligation.

American School, Dept. M928, Drexel at 58th, Chicago

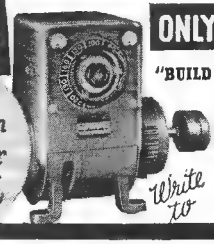
$150 TO $300 PROFIT MONTHLY with "Simplified" ARC WELDING

FREE BOOK on "Profits for Welding Shops"

BUILD A BIG PAY BUSINESS OF YOUR OWN

New low prices, easy "pay-out-of-profit" terms on new 40 Volt Arc Welding. Opens door to big pay jobs that carry real profit. Hobart Welders are easier to operate, faster, and opens up a big field in the quality welding business. 30 Days Trial in your shop lets you prove that extra profits will let it pay its own way.

30 Days Trial *To Prove it*



Write to

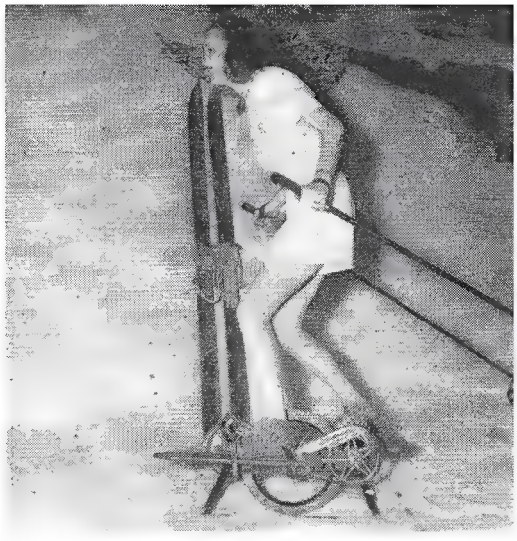
ONLY $20 MONTHLY *puts it in your shop*

"BUILD YOUR OWN" SAVE $300 TO $500

This compact welder unit, your motor and chassis gives you modern portable welder that lets you get profitable outdoor jobs. Write today for details—no obligation.

HOBART BROS., Box SM128 **TROY, OHIO**

Machine Enables Skier To Practice Indoors



Mounted on a tubular metal frame, a newly invented device enables skiing enthusiasts to keep in practice all year round. The device features two ski-like pedals, which the operator motivates in the same manner as in skiing, as demonstrated above by Virginia Grey, Hollywood motion picture star. The pedals are connected by a chain to a small wheel, which actuates a meter showing how many miles the skier has traveled during the practice period.

Few Real Meteorites Found, Geologist Declares

Remember that funny rock you found last year? Looked like a meteorite, didn't it? Well, the chances are just 2,000 to 1 that it isn't according to figures collected by Dr. E. P. Henderson, curator of the Smithsonian Institution's meteorite collection in Washington, D. C.

Judging from past averages, he expects to receive about 2,000 "meteorite" samples during the coming year, of which only one or two will actually be meteorites. The rest will be assorted mineral junk, mostly ordinary garden variety stones.

Iron cannonballs, after a few generations of rusting, could easily be mistaken for meteorites, but, according to Dr. Henderson, it is just as possible for an iron meteorite to be mistaken for a rusted cannonball. Many things of definite terrestrial origin are sent to the Smithsonian as meteroite samples, including a stomach stone from a cow.

•Inventors Free Books

Answer your questions!

Practical Facts You Will Want to Know About

PATENTS TRADE MARKS COPYRIGHTS

•These C. A. Snow & Co. Free Books will save you TIME and MONEY!

Now one of America's oldest firms of patent attorneys offers you important facts on how to protect and commercialize your ideas..the very facts which can save you wasted hours and unnecessary expense. These free books are based on 63 years' experience and tell you exactly what to do to protect your invention.

Find Out RIGHT NOW

Before going any further with your idea—be sure you are on the "right track". You will be able to know *before* spending more time and money the costs and procedure in obtaining a patent. In the books you will find the plain answers to questions that have long bothered inventors.

Confidential, quick service

Our years of experience in helping others should make you feel perfectly safe in dealing with this reputable firm. All inquiries are answered immediately and held in strictest confidence. Write today.

TEAR OUT and Mail Coupon Today

C. A. SNOW & CO.

Registered Patent Attorneys Since 1875

Dept. 3128, Snow Building, Washington, D. C.

Gentlemen: Please send me absolutely free and without obligation on my part, your original document "Certification of Invention", together with your two guides for Inventors, "How We Protect You" and "Suggestions On How to Commercialize Your Invention."

Name .....

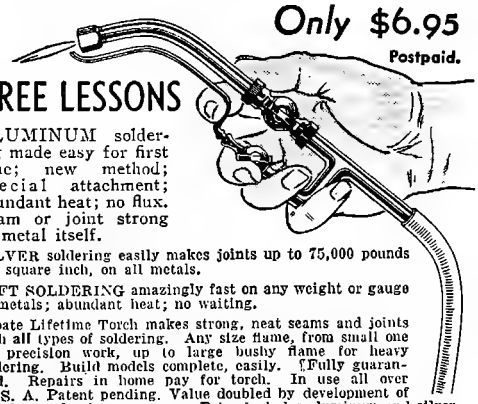
Street and No. .....

City or Town..... State.....

New GAS SOLDERING TORCH for SHOP and HOME

One Easy Connection to City Gas
No Oxygen • No Air • No Blower

Only $6.95
Postpaid.



FREE LESSONS

ALUMINUM soldering made easy for first time; new method; special attachment; abundant heat; no flux. Seam or joint strong as metal itself.

SILVER soldering easily makes joints up to 75,000 pounds per square inch, on all metals.

SOFT SOLDERING amazingly fast on any weight or gauge of metals; abundant heat; no waiting.

Choate Lifetime Torch makes strong, neat seams and joints with all types of soldering. Any size flame, from small one for precision work, up to large bushy flame for heavy soldering. Build models complete, easily. ¶Fully guaranteed. Repairs in home pay for torch. In use all over U. S. A. Patent pending. Value doubled by development of brand new aluminum process. Price includes aluminum and silver solders, flux, extra tips, attachment. ¶FREE with order: Expert treatise on aluminum, silver and soft soldering. Send no money. Order C.O.D., pay postman $6.95 plus postage. If cash with order, we pay postage. Choate Torch Co., 3466 Principio, Cincinnati, Ohio.

New Ideas now Salable Before Patenting

Practical, useful inventions may now be safely marketed without patenting expense. Write for proof that we successfully sell patented and unpatented inventions.

CHARTERED INSTITUTE OF AMERICAN INVENTORS
Dept. S, Barrister Building Washington, D. C.

America's Smallest Radio ... WITH BIG SET FEATURES

A real radio in every respect. Small enough to carry in one hand (6¾" x 5" x 4¾") yet powerful enough to bring in stations clear and strong. Dynamic speaker. Complete with 4 full size GENUINE RCA tubes and aerial—ready to play on any 110 volt, 60 cycle current. One year guarantee. **Free Home Trial.**

$6.94 in Walnut

IVORY...Slightly Higher

Money Back Offer! Rush $1 deposit Balance C. O. D.

1939 CATALOG FREE

Silver Mfg. Co., Inc., Dept. M. 2868 Elston, Chicago

Learn Photography at HOME

Splendid opportunities. Prepare quickly in spare time. Easy method. No previous experience necessary, common school education sufficient. Many earn while learning. Send for free booklet "Opportunities in Modern Photography", particulars and requirements.

AMERICAN SCHOOL OF PHOTOGRAPHY
3601 Michigan Avenue Dept. 2059, Chicago, Illinois

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of MECHANIX ILLUSTRATED, published monthly at Louisville, Kentucky, for October 1, 1938.

State of Connecticut } ss.
County of Fairfield }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Roger Fawcett, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the MECHANIX ILLUSTRATED and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, W. H. Fawcett, Greenwich, Conn.; Editor, Robert Hertzberg, New York, New York; Managing Editor, Ralph Daigh, New York, New York; Business Manager, Roger Fawcett, Larchmont, New York.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) Fawcett Publications, Inc., Greenwich, Conn; W. H. Fawcett, Greenwich, Conn.; Roger Fawcett, Larchmont, N. Y.; W. H. Fawcett, Jr., Springdale, Conn.; Marion F. Bagg, Tulsa, Okla.; Gordon Fawcett, Hollywood, Calif.; Roscoe Kent Fawcett, Port Chester, N. Y.; Frances M. Fawcett, Greenwich, Conn.; Margaret Connor, Seattle, Wash.; Eva Adams, Seattle Wash.; Clarence Fawcett, Portland, Ore.; Gloria Fawcett Trust, La Jolla, Calif.; Virginia Lee Fawcett Trust, La Jolla, Calif.; John Fawcett Trust, Hollywood, Calif.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

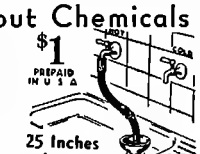
5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is ———. (This information is required from daily publications only.)

ROGER FAWCETT,
Business Manager.

Sworn to and subscribed before me this 20th day of September, 1938.
Helen M. Lane, Notary Public.
(My commission expires February 1, 1941.)

Cleans Drains without Chemicals!

Revolutionary invention, using water pressure from the faucet. Opens clogged drains. Flushes them out and leaves drain free of stoppage. Clean and sanitary, easy to use. Full instructions packed with each "Drain Flusher." Fully guaranteed. Thousands in use in homes, apartments, hotels and factories. If you are having drain trouble in your kitchen sink, washbowl, laundry tubs, etc., and want a sure cure for this condition, send your order today for a "DRAIN FLUSHER" $1.00 postpaid, or sent C.O.D., plus a few cents extra charge.



BROOKS-HILL CO.
711 N. RIDGEWOOD PLACE
LOS ANGELES, CALIF Dept. —109

Free AIR CONDITIONING AND REFRIGERATION TRIAL LESSON

FREE TRIAL LESSON

Trained men needed. Good pay. Opportunities. Learn easily AT HOME in spare time (or at our Chicago School). Send for **FREE TRIAL LESSON.** No charge for this now or later. Write today.

CHICAGO TECHNICAL COLLEGE
S-317 Tech Bldg., 118 E. 26th St., Chicago Ill.

TURN SCRAP INTO MONEY

AUTOPOWER tells you how in plain, easy, simple and illustrated instructions that anyone can follow. Change auto generators into useful, practical A C and D C generators and motors with voltage from 2 to 1,000 volts, for power, light, welding, radio, sound, etc. No previous experience nor special tools needed. Generators can be driven by wind, water, fan belt, etc. INSTRUCTIONS FOR BUILDING AN A C WELDER THAT ACTUALLY WORKS UP TO A 3/16" ROD. ALSO COMPLETE PLANS FOR WIND AND WATER POWER PLANTS. Send for your copy of "AUTOPOWER." Already used and endorsed by thousands. Only $1.00 postpaid.

S. W. DUNCAN, Publisher 412 S. Hoyne Ave., Chicago

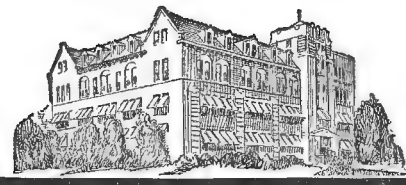
Weapon Shoots Balls Of Fire

A new type of gun, which has been invented by Delter Webster, of Eugene, Oregon, shoots balls of fire instead of bullets. The balls consist of compressed powder pellets which burst into flame as they leave the muzzle of the gun. The new weapon is said to have military possibilities, particularly as an anti-aircraft defense weapon if produced in guns of large caliber.

Clock Controlled By Signals Received By Radio Set

A radio clock, built either as an auxiliary or as an integral part of an otherwise ordinary radio receiver, and controlled by signals sent out from the broadcasting station along with the regular program, has been patented by a New Jersey inventor. Designed by Walter van Braam Roberts of Princeton, the device is said to tell time to the nearest five minutes, but can be modified to tell time to the nearest minute and second.

Controlled by a master clock at the radio station, signals are sent out at the selected interval. The signals consist of low frequency modulations, below the range audible to the human ear. Received by the receiver at the same time the regular program is coming in, the signals cause reeds to vibrate. The reeds in turn permit to pass or do not permit to pass a beam of light directed toward a screen. The position of the light beam indicates the time.



High School Course at Home

Many Finish in 2 Years

You can complete this simplified High School Course as rapidly as your time and abilities permit. Equivalent to resident school work—prepares you for entrance to college. Standard H. S. texts supplied—Diploma. Credit for H. S. subjects already completed. Single subjects if desired. High School education is very important for advancement in business and industry and socially.

College Entrance

During the past 14 years, our High School graduates have been admitted to 531 different Universities, Colleges, Junior Colleges and Normal Schools—80% of them without entrance examination. Course also prepares for teachers' certificate and pre-professional examinations.

Business—Industry

To get and hold a good position in Business today you must be able to write clear, accurate letters and reports—do figuring involving Algebra and Geometry—talk intelligently on matters requiring a knowledge of Geography, History, and Economics.

In Industry—Mechanical and Engineering lines—you must have at least an elementary knowledge of Physics and Chemistry—be able to figure quickly and accurately—know something of Mechanical Drawing and blueprints—and be able to talk and write accurately and clearly on both your work and ordinary topics of conversation.

Our High School course meets the preparatory educational requirements for Business and Industry.

An Educational Institution

The American School was chartered in 1897 as an educational institution, not for profit—and is exempt from paying Federal income tax, like the best resident colleges and universities.

Don't Be Handicapped—Complete Your Training Now

Be a High School Graduate! Prepare yourself for promotion in Business and Industry—for the Professions, College Entrance and social success. No matter what line you may select, High School training will prove invaluable to you! Our moderate fees cover all instruction, standard textbooks and Diploma. Easy monthly terms. Get ahead in life. Start your training NOW!

20 Other Courses

Over 150 noted Educators, Engineers, and Business Men helped prepare our special instruction material, which is used by many resident schools and colleges, U. S. Navy, and Province of Manitoba, Canada. We offer you quality training at home for the best-paying lines of Industry and Business, as listed in the coupon.

Mail coupon for information about line that interests you

American School, Drexel at 58th, Chicago

American School, Dept. H928, Drexel at 58th, Chicago
Tell me how to train for success in line checked. No obligation. ☐ High School Course

☐ Accounting & Auditing	☐ Diesel Engineering
☐ Architecture & B'lding	☐ Drafting & Design
☐ Automotive Engin'ring	☐ Liberal Arts
☐ Business Management	☐ Private Secretary
☐ Com'ercial Aeronautics	☐ Hi'er Ac't'g (C.P.A.)
☐ Electrical Engineering	☐ Highway Engin'r'g
☐ Electrical Refrigerat'n	☐ Mechanical Eng'r'g
☐ Air Conditioning	☐ Radio & Television
☐ Civil Engineering	☐ Salesmanship
☐ Complete Law	☐ Steam Engineering

Name.....

Address.....

It's Easy to be a Contractor

Learn how to estimate, how to plan buildings so as to make money on them, learn all about remodeling problems and how to bid on any job. All these facts and thousands more are set forth clearly in a remarkably interesting way in these five wonderful books covering all phases of Architecture, Carpentry and Building. These books are complete and the new JIFFY INDEX makes it possible to find anything you want to know about building in a few seconds.

"Boss" Carpenters in Demand

New public works jobs—immense projects all over the country are requiring men who can "Boss the Job"—**Men who know how.** These books give you **"QUICK"** training. With them you don't have to be afraid to tackle any job for you can find needed facts in a hurry. If you send now we will include without extra cost a big 120 page book "Blue Print Reading." IN ADDITION TO THE FIVE BIG BOOKS.

Coupon Brings Books FREE for Examination

American Technical Society, Dept. G9320
Drexel at 58th St., Chicago, Ill.

You may ship the five big books on Architecture, Carpentry and Building, include book on blue print reading. I will pay the few cents delivery charges only and if I am fully satisfied after 10 days I will send you $2. After that only 3.00 a month until the total reduced price of only $19.80 (former price 24.80) is paid. I am not obligated in any way unless I keep the books.

Name .....

Address .....

Employer's Name .....

Please attach a letter giving age, occupation and the name and address of your employer and that of at least one business man as reference.

MY DIESEL JOB

"GETTING IT AND HOLDING IT IS THE RESULT OF MY DIESEL TRAINING" —say scores of Hemphill graduates

BE a b tter-than-average man in a fast growing industry—that's the best formula for future security and independence. . . . No matter where you live, investigate if you can qualify for Hemphill Diesel training—Day, night, and combination home training with later shop work courses.

Send coupon to nearest school

HEMPHILL DIESEL SCHOOLS LOCATED AT:

BOSTON, 122 Brookline Ave.; NEW YORK, 31-29 Queens Blvd., L. I. C.; DETROIT, 2344 W. Lafayette Blvd.; CHICAGO, 2013 Larrabee St.; MEMPHIS, 423 Monroe Ave.; LOS ANGELES, 2018 San Fernando Rd.; SEATTLE, 509 North Westlake Ave.; and VANCOUVER, B.C., 1361 Granville St.

HEMPHILL DIESEL SCHOOLS

Please rush information on Diesel opportunities and data on your courses.

NAME_____ AGE____

STREET _____

CITY_____ STATE_____

NEW TYPE CHEAP OIL BURNER Sweeping the Country!!

COOK and HEAT Without Coal or Wood

In Your Present Stove or Furnace—HOTTER No Drudgery, Dirt or Ashes—More Heat Quick at SMALL COST.

OVER 40,000 SOLD

Amazing oil burner burns cheap oil a new way, without pre-generating or clogging up; quick intense heat at TURN OF VALVE.

AGENTS Salesmen BIG MONEY

SENT ON TRIAL Prove it's efficiency, convenience and economical operation. Write for

FREE BURNER OFFER to agents who will demonstrate and take orders—be first to learn how to end drudgery, dirt and ashes of coal and wood and make big money. Spare or full time—mail 1c postcard today.

Slips Into Any STOVE RANGE or FURNACE.

UNITED FACTORIES, P-600 Factory Building, Kansas City, Mo.

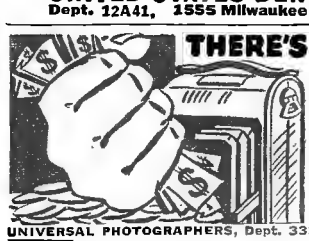
Enjoy BEAUTIFUL Natural-Looking FALSE TEETH

LOWEST PRICES

SEND NO MONEY

60 DAYS' TRIAL We make—BY MAIL—the World's No. 1 **FIT-RITE** Dental Plates for men and women—from impressions taken in your home. Thousands of pleased patrons. **MONEY-BACK GUARANTEE** YOU'LL BE SATISFIED. Monthly payments possible. **FREE** mouth-forms, easy directions and catalog. WRITE TODAY! *C. T. Johnson*, Pres.

UNITED STATES DENTAL COMPANY
Dept. 12A41, 1555 Milwaukee Ave. Chicago, Ill.



THERE'S MONEY IN YOUR CAMERA!

Others make good incomes selling pictures to publications. **FREE CATALOG** describes home-study course (which may be paid for in easy installments) and tells how **YOU** can do it too!

UNIVERSAL PHOTOGRAPHERS, Dept. 3312, 10 West 33 St., N. Y. C.

WANTED—MEN

to cast Christmas Goods, 5 and 10c Novelties, Toy Autos, Ashtrays, etc. Can be done in any spare room, basement or garage and no experience necessary. A rare opportunity to devote spare or full time to profitable work. Write Dept, 2.

METAL CAST PRODUCTS CO.
1696 Boston Road New York City.

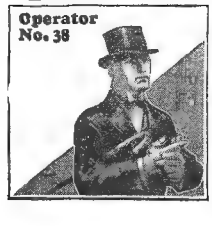
TRAIN FOR Radio IN 12 WEEKS

BY SHOP WORK

I'll Finance Your Training

Prepare for jobs in Broadcasting, Talking Pictures, Television, Wireless, etc., by **12 weeks practical shop training** in Coyne Shops. Free Employment Service. Many earn while learning. You don't need previous experience or a lot of book learning. Write for **BIG FREE RADIO and TELEVISION BOOK**, and my **"Pay-Tuition-After-Graduation" Plan.**

H. C. LEWIS, Pres., RADIO DIV., Coyne Electrical School
500 S. Paulina Street Dept. 98-1H, Chicago, Illinois



FOLLOW THIS MAN

Secret Service Operator No. 38 is on the job! Running down dangerous Counterfeit Gang. Tell-tale finger prints in murdered girl's room.

Free *The Confidential Report Operator No. 38 made to his chief. Write for it.*

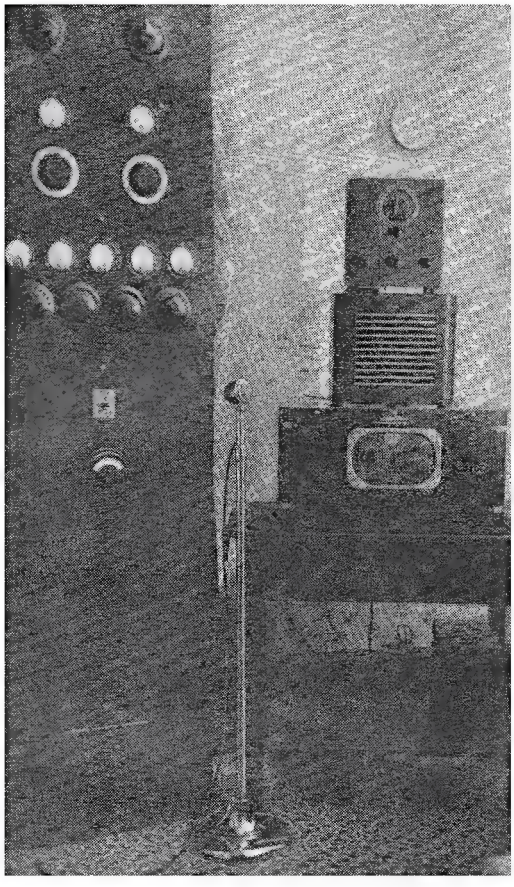
Earn a Regular Monthly Salary

YOU can become a Finger Print Expert at home, in your spare time, at small cost. Write for confidential full report and details. Literature will be sent only to persons stating their age.

INSTITUTE OF APPLIED SCIENCE
Dept. 2359 1920 Sunnyside Ave. Chicago, Ill.

Editor's Workbench Chips

[*Continued from page* 21]

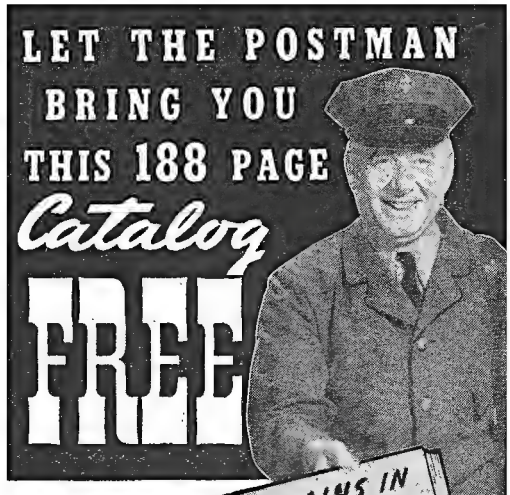


One of the best looking and well equipped amateur radio stations, according to reader John Sullivan, is that shown above. It is operated by John's friend, James Pepper.

Feeling that his friend James Pepper had assembled such an excellent amateur radio station that a picture of it merited space in MI, John Sullivan, of Niagara Falls, N. Y., sent in the photograph above, thereby earning a $3 award. The transmitter is a 1000-watt phone and the rig consists of a heavy duty power supply, modulator, RF oscillator, RF amplifier and antenna tuner. John neglected to state what Pepper's station call letters are, but I'm asking him to send them in, so if any of you "hams" want to contact him, send in your request for the call letters.

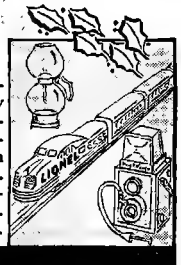
***

Workshop fans who would like to try something new in the way of craftsmanship will enjoy the article, explaining how to do Plastic Wood inlaying, in the January issue of MECHANIX ILLUSTRATED. This work is not difficult, and after you have read the directions, you certainly will want to try it.—*The Editor.*



Cover to cover it's brand new. New 1939 Lafayette Radios, 60 new models . . . every one a streamlined beauty and all priced within easy reach. Complete list of nationally advertised radio parts and equipment. Sensational new television kit, plus the biggest selection of build-them-yourself radio kits. New photography section solid-packed with real values. 188 pages of standout buys! Send for your **FREE** copy. It's today's buying—*and saving*—guide.

Special Xmas Catalog



Be sure to send for our special **FREE** Christmas catalog — out now in time for thrifty Christmas shopping. This year give practical gifts. Largest selection of gifts anywhere — electric trains, cameras, modern appliances, electric shavers, radios . . . Shop at home in comfort with this greater-value gift catalog—save time and money. Check both catalogs on coupon and mail.

WHOLESALE RADIO SERVICE CO. INC.

NEW YORK, N.Y. • CHICAGO, ILL. • ATLANTA, GA.
100 SIXTH AVENUE 901 W. JACKSON BLVD. 265 PEACHTREE STREET
BOSTON, MASS. • BRONX, N.Y. • NEWARK, N.J. • JAMAICA, L.I.

WHOLESALE RADIO SERVICE CO., INC.
100 Sixth Avenue, New York, N. Y.

Rush **FREE** 1939 Gift Catalog No. 75-22M8
Rush **FREE** 1939 Radio Catalog No. 73-22M8

Name_____

Address_____

City_____

LET "VALU-BILL" BE YOUR SANTA

PASTE COUPON ON PENNY POSTCARD

I'll Train You in DRAFTING until You Get a GOOD PAY JOB

GET MY PROVEN PAY RAISING PLAN

Get practical training. Take up Drafting—because it gives you bigger, better chance to get into your favorite field—Electricity, Aviation, Diesel, Air Conditioning, Automotive, Building, Machinery, Transportation, etc. Remember, everything built has its birth on the Draftsman's Table.

Draftsmen Draw Good Pay

I have trained thousands of men aged 16 to past 50 in their spare time at home, to qualify for Bigger Jobs at Better Pay. Let me train you in a short time by same easy, low cost practical method. No experience needed. High School education not necessary.

FREE BOOK

All Working Tools Furnished

You get complete Professional Draftsman's Tools and Drawing Table—sent without extra charge at once. Mail coupon for Free Book about my PROVEN PAY RAISING PLAN. Write TODAY!

ENGINEER DOBE, Div. 4739, Libertyville, Illinois

ENGINEER DOBE, Div. 4739, Libertyville, Ill.

Send me your Free Book "SUCCESSFUL DRAFTSMANSHIP." Explain how you assist your graduates to good positions as Draftsmen.

NAME.....AGE.....

ADDRESS.....

TOWN.....STATE.....

Hammer Forged Tools at Bargain Prices!

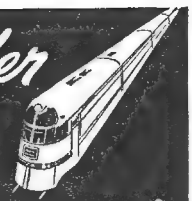
You'll save time, materials and money if you do those delicate chiseling jobs with ACE's 5-item hammer-forged chisel sets! Used by experts! Each tool handmade of best quality metal! Amazingly low-priced! Set of 5 chisels as shown (including flat, cape, round nose, diamond point, and center punch). Size: 3/16"x3½". Also set of 5 assorted pin punches, same size. Both sets for only $1.00!

Special Offer: Catalog, instructions, and any tool from above sets—10c.

Order NOW and obtain perfect work with perfect tools!

ACE TOOL CO., Johnson City, N. Y.

No Wonder DIESEL PAYS SO BIG!



Diesel Engines produce **"LOW COST"** power—the newer ones are unbelievably light in weight. High Speed trains, passenger busses; huge trucks and now airplanes have adopted **DIESEL POWER.** Think what that will mean in the way of opportunities for **DIESEL TRAINED MEN.**

Learn Diesel at Home

Get into this profitable field **NOW**—prepare for an ever increasing demand—know the answer to any Diesel problem. We train you at home in **SPARE TIME.** No need to waste a minute or interfere with work or pleasure. Prepare for advancement the Diesel way. Get in line for a Big Pay Job. Write for **FREE** bulletin — there is no cost or obligation.

AMERICAN SCHOOL

Dept. D928, Drexel at 58th Chicago

MOUNT YOUR OWN

BIRDS · ANIMALS · FISH — TAN HIDES · NOVELTIES

Complete Home Course

7 Books, 63 Lessons, 40,000 Words. Profusely Illustrated. Tells and shows you every step in skinning and mounting birds, animals, fish, tanning hides and making novelties. **NO EXPERIENCE NECESSARY.** Starts you mounting first day. Nothing left out. Makes Taxidermy as simple as A. B. C.'s. Enthusiastically praised by thousands. Turn your spare time into **MONEY** . . . have **FUN** doing it. Learn Taxidermy . . . NOW! **MONEY BACK GUARANTEE—HURRY!** Send $1 today . . . or pay postman $1 plus postage. Nothing more to pay.

FORMERLY $15.00 Now $1 FOR ALL 7 BOOKS Post Paid

SCHMIDT SCHOOL, Dept. H-12, Memphis, Tenn.

write BASS for these

BASS BARGAINGRAMS No. 234 and 236 • Just off the press—free for the asking...No. 236 lists thousands of Still camera bargains...No. 234 lists new and used 8 and 16 mm. silent and sound movie equipment. Mention Dept. M I.

Bass CAMERA CO.

179 W. MADISON ST., CHICAGO, ILL.,

AVIATION

If you are interested in a comprehensive Technical Training Program to prepare you for

APPRENTICESHIP

MECHANIC PILOT METEOROLOGIST

Write, immediately, enclosing stamp—

MECHANIX UNIVERSAL AVIATION SERVICE CO.

Wayne County Airport, Box 857, Dept. A, Detroit, Mich.

FREE BARGAIN CATALOG of BOOKS

25,000 books of all publishers listed in our 44th Annual Bargain Catalog of 320 pages. Old-time favorites—latest "best sellers." Reference, Fiction, Juvenile, History, Scientific, etc. Supplying schools, colleges, libraries and thousands of individual customers. **Send postcard today for our new 1939 catalog, "Bargains in Books."**

THE BOOK SUPPLY COMPANY, Dept. 247

564-566 West Monroe St., Chicago, Illinois

AMAZING MACHINE GROWS HAIR

"Intermittent Vacuum" stimulates deep-lying scalp blood vessels—and GROWS HAIR in thousands of cases of baldness. Stops falling hair. Tones up scalp. New hair often in 90 days. Easy to use this amazing machine at home. Only $9.95 complete. Write quick for FREE TRIAL OFFER.

Only $9.95 COMPLETE

FULLY GUARANTEED

RAND, DEPT. R-1660, NEWPORT, KY.

LIGHTS ITSELF SELLS ITSELF

Quick Action (1938) Perfected SELF STARTING LIGHTER

Lights cigar, cigarette or pipe—instantly. Never fails. New principle in ignition. No flint. No friction. Send 25c for sample and money-making sales plans.

NOW RETAIL 25c

Start now. You can make up to $5 a day.

NEW METHOD MFG. CO.

Sole Makers of Catalytic Automatic No Flint Gas Lighters

Box M-72, Bradford, Pa., U. S. A.

No Wind Can Blow It Out

Packed in DISPLAY BOX

25c Retail

Doz. $1.75

Gross $18.00

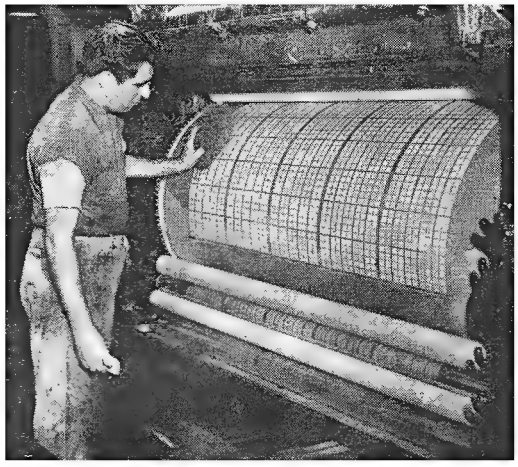
WE MATCH PANTS ToAnySuit!

Double the life of your coat and vest with correctly matched pants. **100,000 patterns.** Every pair hand tailored to your measure. Our match sent **FREE** for your O. K. before pants are made. Fit guaranteed. **Send piece of cloth or vest today.**

SUPERIOR MATCH PANTS COMPANY

209 S. State St., Dept. 778, Chicago

Machine Prints And Gums Sales Tax Stamps



When the City of New York decided to place a tax on the sales of cigarettes, it was necessary to issue millions of special tiny stamps which could be affixed to the glossy cigarette packages and special machines were required for the job. In the photograph above, a pressman is shown cleaning the plate from which the first part of the stamp design is printed. In addition to printing the stamps, the machine applies a gummed adhesive coating to the back of each stamp.

Humidity May Hurt Walls

ARTIFICIAL humidification of the air should not be tried in buildings of ordinary construction during the winter as it may result in serious damage to the building, C. P. Yaglou warns in a recent issue of the Journal of the American Medical Association. Normal humidity is all they can safely carry.

Discussing air conditioning, Mr. Yaglou reports that artificially high humidity may result in the condensation of moisture on cold walls of the building to such an extent that the moisture will seep through. Not only can it damage plaster and wood construction and loosen wall paper, but it may also get into cracks in the outside sheathing. If that happens, the sheathing may be damaged during the first frost, for water expands when it freezes.

Reason for the condensation of water on cold walls is the fact that air can hold larger amounts of water vapor when it is at a higher temperature. Warm air from the center of a room coming into contact with a cold wall or window deposits the moisture it cannot keep when it is cooled.

WORK FOR THE GOVERNMENT

START

$1260 to $2100 Year

Many 1939 Examinations Expected

Get Ready IMMEDIATELY

Railway Postal Clerks

Railway Postal Clerks get $1,900 the first year regular, being paid on the first and fifteenth of each month. ($79.17 each pay day.) Their pay is automatically increased yearly to $2,450. Advance may be had to Chief Clerk at $2,700 a year. ($112.50 each pay day.)

3 Days On—3 Days Off—Full Pay

Railway Postal Clerks on long runs usually work 3 days and have 3 days off duty or in the same proportion. During this off duty their pay continues just as though they were working. They travel on a pass when on business. When they grow old, they are retired with a pension.

City Mail Carriers, Post Office Clerks

Clerks and Carriers now get $1,700 the first year on regular and automatically increase $100 a year to $2,100 and $2,300.

Many Other Positions

Many other positions are obtainable. Accountants—Stenographers—Typists—Clerks at Washington, D. C., etc. Those wishing these positions should qualify at once.

Get Free List of Positions

Fill out the following coupon. Tear it off and mail it today—now, at once.

This investment may result in your getting a big-paid government job.

FRANKLIN INSTITUTE, Dept. C259, Rochester, N. Y.

Rush to me, entirely free of charge (1) a full description of U. S. Government Jobs; (2) Free copy of illustrated 32-page book, "How to Get a Government Job"; (3) List of U. S. Government Jobs; (4) Tell me how to qualify for a U. S. Government Job.

Name .....

Address .....

Use This Coupon Before You Mislay It. Write or Print Plainly.

THE XMAS GIFT THAT WILL MAKE THE SHOP COMPLETE

An Ideal Present to the Craftsman Machinist and Mechanic • • •

No. 413-YA, 9¼" swing by 3' bed Workshop Bench Lathe with Horizontal Motor Drive, ¼ H.P. Reversing Motor, Switch, Belts, and Adjustable Belt Tension Countershaft. Wt. 320 lbs. **$117.00** *($15 down—$7 mo. for 18 mo.)*

$85.00
Less Motor Drive
Sold on Easy Payments as low as $6.00 a month for 12 to 18 months.

THE SOUTH BEND BACK-GEARED, SCREW CUTTING METAL WORKING PRECISION LATHE

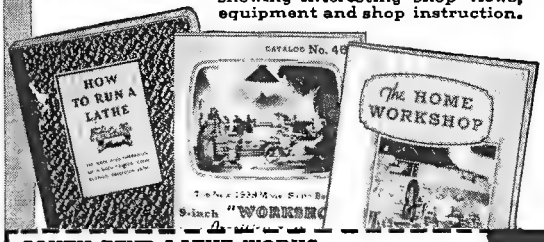
A Universal Lathe of Highest Quality and Accuracy for doing Model Work—Home Workshop Projects—Tool and Instrument Repair—Gunsmithing—Engineering Jobs—Inventive Work—Auto Repair—Electrical and Radio Service—Laboratory Work—General Shop Repair—and Metal Working Operations of All Kinds. . . . .

Send Coupon FOR THESE BOOKS

"How to Run a Lathe"—128 pages, 350 illustrations on lathe operation and valuable shop hints.

Catalog No. 46-A—illustrates, describes and prices 9" lathe in 3', 3½', 4' and 4½' bed lengths and 8 drives.

"The Home Workshop"—32 pages showing interesting shop views, equipment and shop instruction.



THE South Bend 9-inch Workshop Lathe is a gift to please any man or boy mechanically inclined. Besides a tool which will perform practically every metal working job in the shop, the 9" Workshop Lathe is a fine, precision machine. Accuracy—speed—and durability are designed and built into the 9" Lathe with all the skill and experience our 32 years of building fine lathes can produce.

Hundreds of different machining jobs can be handled on the 9" Workshop Lathe, such as drilling, turning, boring, reaming, cutting screw threads, facing, milling, filing and chucking in steel, iron, as well as wood, plastics, etc.

Features: Precision Lead Screw for cutting screw threads 4 to 112 per inch, Ball Thrust Bearing on Spindle, Twin Gear Reverse to Lead Screw, Automatic Longitudinal Screw Feed, ¾" spindle hole takes collets up to ½"-

38 attachments available for milling, grinding, draw-in collet chuck work, taper work, and other operations.

Used by well-known manufacturers in this country and abroad. The exacting requirements to which the 9" Lathe is held in doing tool and die work, production operations, etc., is proof of its accuracy and quality.

Other sizes in 9", 11", 13", 15" and 16" swing, bed lengths 3' to 12', C'shaft and Motor Drive. Priced $85 to $1500.

SOUTH BEND LATHE WORKS
274 East Madison St., South Bend, Ind., U. S. A.

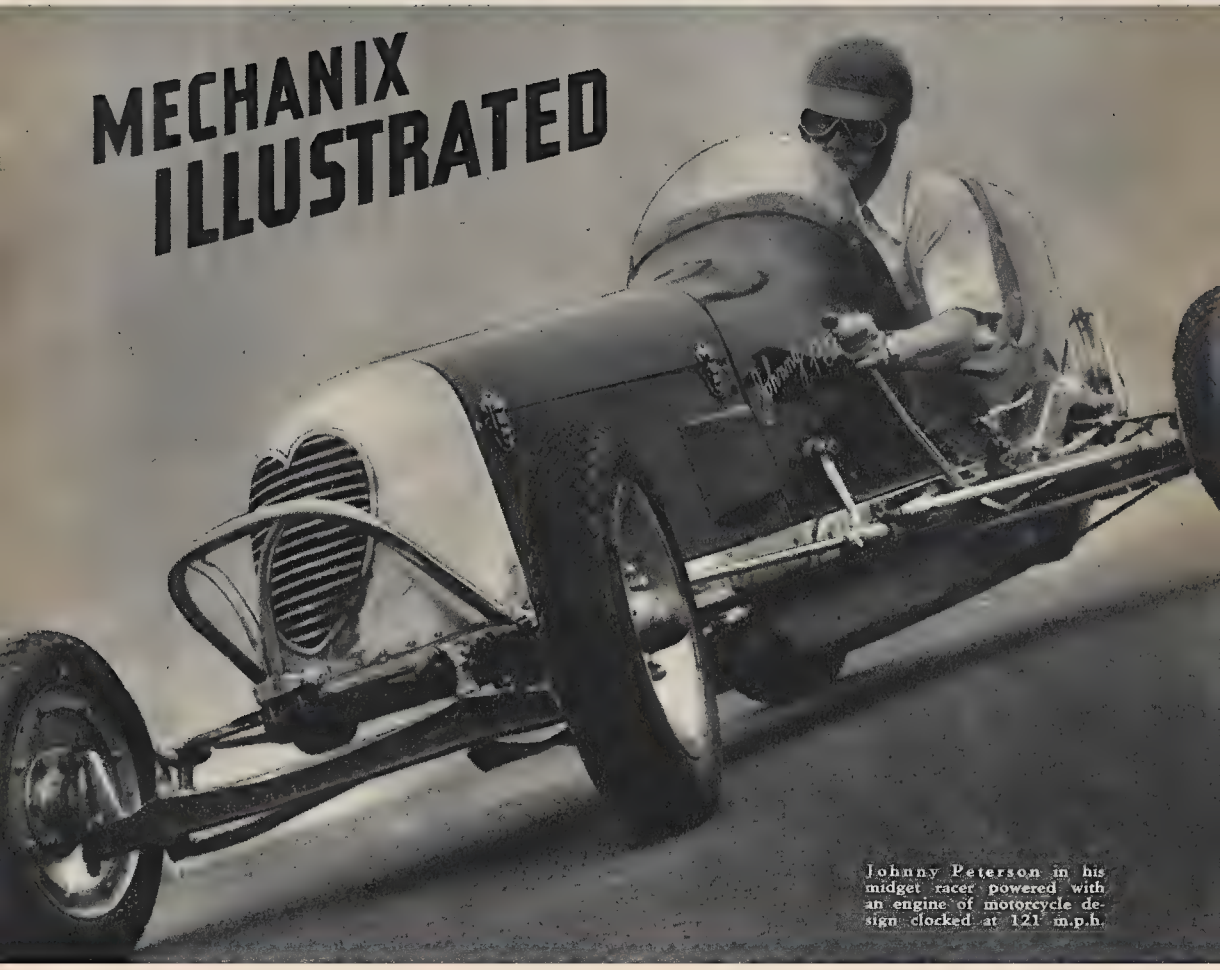
SOUTH BEND LATHE WORKS,
274 E. Madison St., South Bend, Ind., U.S.A.
- ☐ No. 34LB, "How to Run a Lathe," 25c
- ☐ No. 46-A, 9" Workshop Catalog, Free
- ☐ No. 11W "The Home Workshop," Free
- ☐ Easy Payment Plan

Class of Work.....
Name.....
Address.....
City.....State.....

SOUTH BEND *Precision* **LATHES**

W. H. FAWCETT
Vol. XXI No. 2 Publisher December 1938

MECHANIX ILLUSTRATED



Johnny Peterson in his midget racer powered with an engine of motorcycle design clocked at 121 m.p.h.

THRILLS and SPILLS with MIDGET RACERS

Midget racers are motordom's contribution to scientific simplicity. Impish in design, they streak down the tracks at 120 m. p. h.; provide thrills and spills to an excited, roaring crowd.

by Stanley Gerstin

ONE hundred and twenty miles an hour in an oversize kiddy car!

With a coffee grinding motor and cracker box frame these mites of automotive ingenuity roar around the tracks with the same thundering defiance of time and speed as the mightier 350-mile-an-hour powerhouses on wheels of John Cobb and Capt. George Eyston.

Listening to the pint-size engines turn up from a sullen whine to a mighty roar as the midgets flash across the line makes the blood tingle, for midget racing has the knack of getting into a man's blood. As the whir of wheels

fills the air, 10,000 pairs of eyes stalk the streaking darts as though watching death itself circle the track. This is something more than sport. This is something that speeds the pulse and holds you in gripping suspense as you watch in goggle-eyed awe.

This is midget racing. Seven hundred and fifty pounds of blood and iron; of pumping cylinders and turning wheels; of sweaty drivers overflowing from tiny cockpits; of man's ingenuity packed in a thundering crate of metal; of smoke and blinding speed!

This is motordom's contribution to scientific simplicity. Impish in design, stripped of foot brake and clutch, of starter and other gadgets essential to stock cars as well as to other racers, the midgets streak down the straightaways at 70 and 80 miles an hour and take the turns at 40 and 50 bringing the crowd to its feet.

Speed, good driving and the breaks make a race—and sometimes freakish luck such as that of Pete Naccarato. Pete was roaring around the Gilmore track, in Los Angeles, the wheels of his racer just an inch behind the leading car on the turn. As the cars skidded into the straightaway, Pete opened the throttle to pass. At this moment the leading car hit the fence, bounced off, and as Pete swung wide, he was nicked by the skidding car which sent him spinning. Pete was thrown clear but on rolled his driverless car over and over, crossing the finish line just ahead of the other racer with Pete chasing it like a runaway horse. The judges ruled that since Pete's car was the first to cross the finish line, he was entitled to first place although not at the wheel at the time!

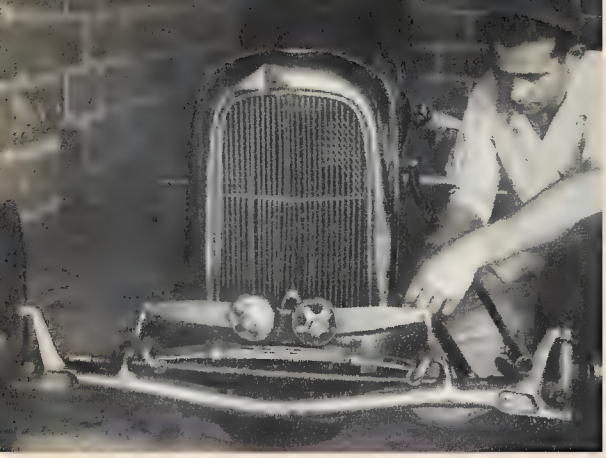
Freak accidents, like Pete's are frequent occurrences. Johnny Peterson, one of the leading drivers on the Eastern tracks this year rode half way round a track on the back of another racer. Johnny was trying to pass on a turn but the car in front clung to the pole. As Johnny squeezed in, he hit the fence, bounced into the other car and his front wheels rolled up over its hood. The two cars clung together for a considerable distance before breaking apart and spilling the drivers. Such spills and thrills of midget racing provide the stuff that makes the crowd roar.

If you wonder what makes the mighty midgets go, look under the hood of these little racers. What you see is a high-powered

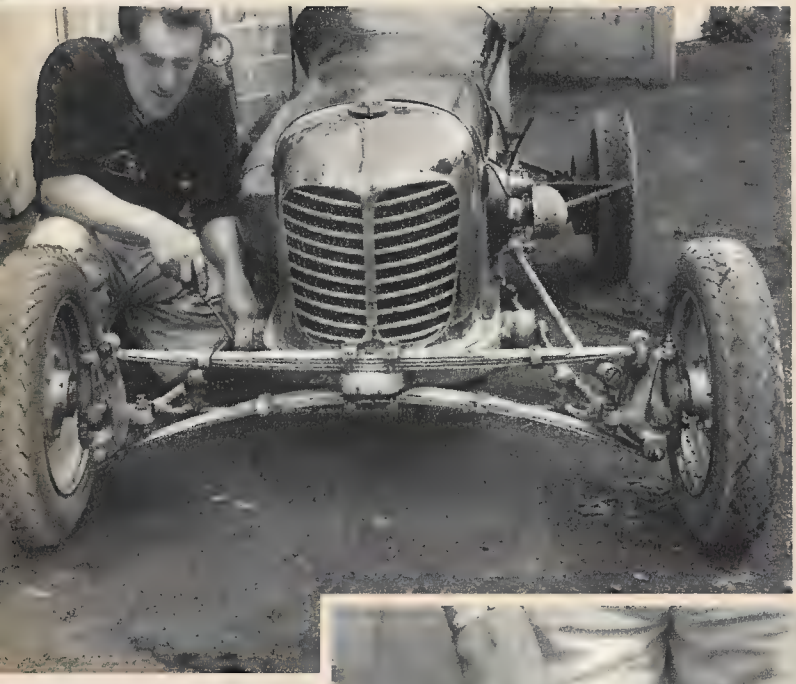
The midgets drift into the turns with throttles open and motors roaring; sometimes come out of them with a burst of speed; sometimes pile up in a heap.

outboard or an engine lifted from a motorcycle, or a small V8 (still too big for the midgets so that the engine spills over the sides) or perhaps some foreign-made contraption turning up to 6,000 or 7,000 r.p.m., and developing 50 to 80 horsepower. They are usually gearless and clutchless with nothing more than an emergency hand brake used only to affect a skid on the turns, and a dog clutch to throw the car in high to start things moving. And can they move!

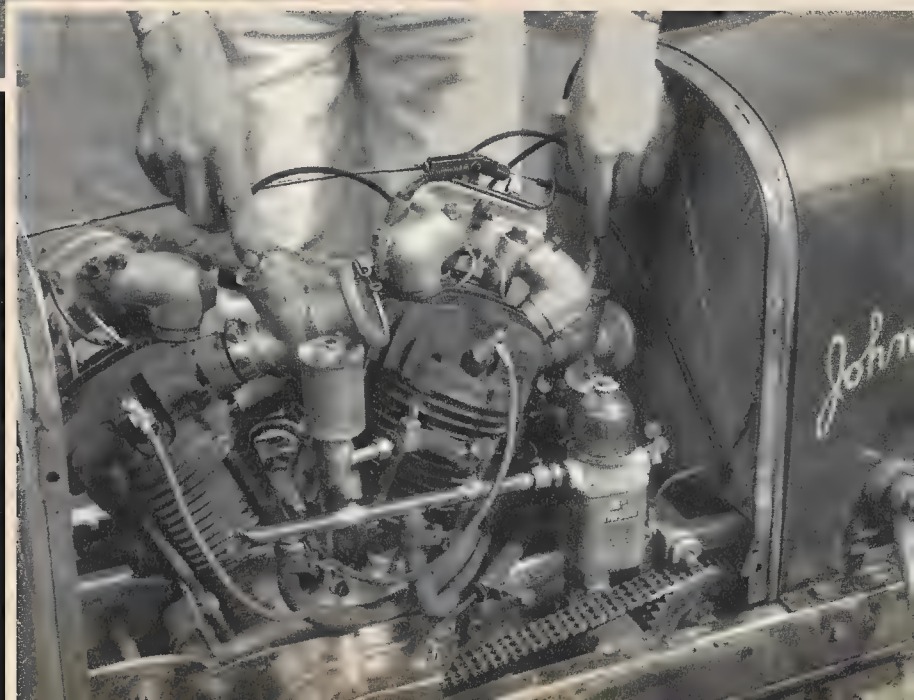
"Texas" Joe Garson roared down a Detroit track at 124 miles an hour driving a midget with an outboard motor. Johnny Peterson thundered across the finish line and was clocked at 121 miles an hour. On the shorter runs such as the ⅕ mile track at Roosevelt raceway in Long Island,



Every driver has his own ideas about how a midget should be built. Jack Yisitis (above) swears by his tubular axle.



On the other hand Bob Meyers disposed of the front axle and uses a spring suspension, as shown. This permits the wheels to pitch on turns, permitting greater speed (above).

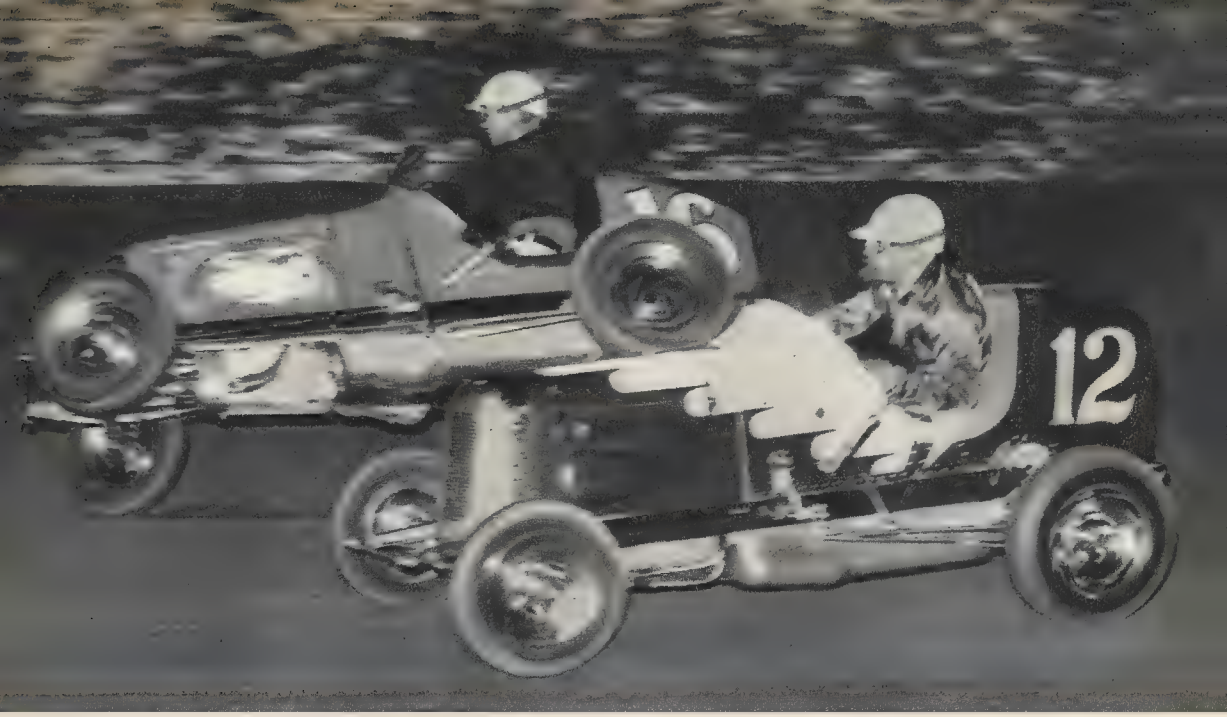


Johnny Peterson's racer is powered by an 80 hp. J. A. P. equipped with 2 carburetors. The engine winds up to a terrific speed. It is overhauled every 12 races.

N. Y., the midgets go into the turns at 70 miles an hour. They take the turns broadside so that they face in the right direction as they come out of the turn. The throttle is opened wide, the motors roar deafeningly and the midget marvels leap into the wind.

Because of their light weight, the midgets are better handled on flat turns, being unable to cling to banked curves like the heavier cars. Taking the turns is a test of the drivers nerve and skill. On reaching the turn the emergency brake is pulled up hard and dropped immediately, to slow the car. Then the wheel is swung hard left (for left turns) and this throws the rear around so that the car faces the infield. At the same moment the driver steps on the gas, giving power to the rear wheels. This holds the car to the ground and the midget literally drifts around the turn. If the rear swings too much, the driver lets up on the gas. If not enough, he opens the throttle more. If you try this stunt with a stock car, be sure to wear a crash helmet!

Pick-up is the main thing with midgets on a small track. Top speed is of secondary importance. A driver can't go anywhere in

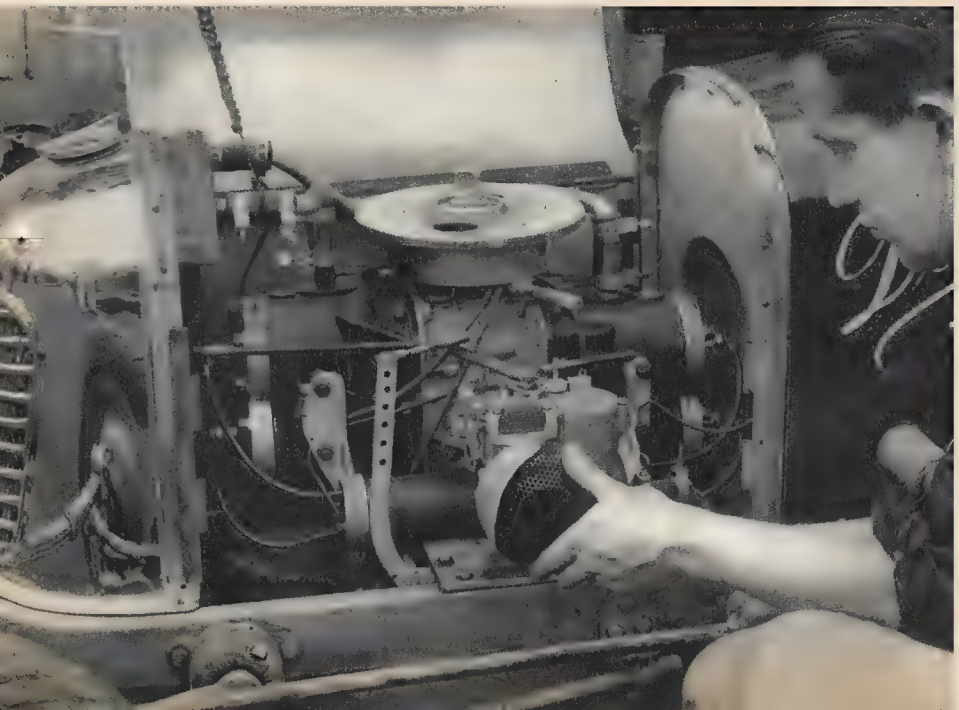


This shows the beginning of a bad spill as the driver in No. 16 rides his rear wheels over the hood of No. 12.

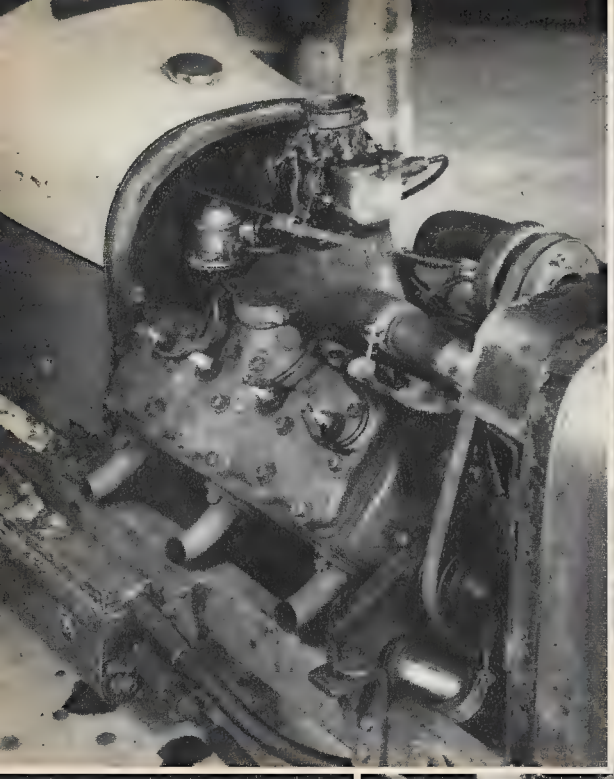
a midget when the straightaway is only 400 feet long if he has slow pick-up, even though his top speed may be terrific. The winners are usually those who go into the turns first, and come out of them most quickly and spurt down the short track to drift into the turn again.

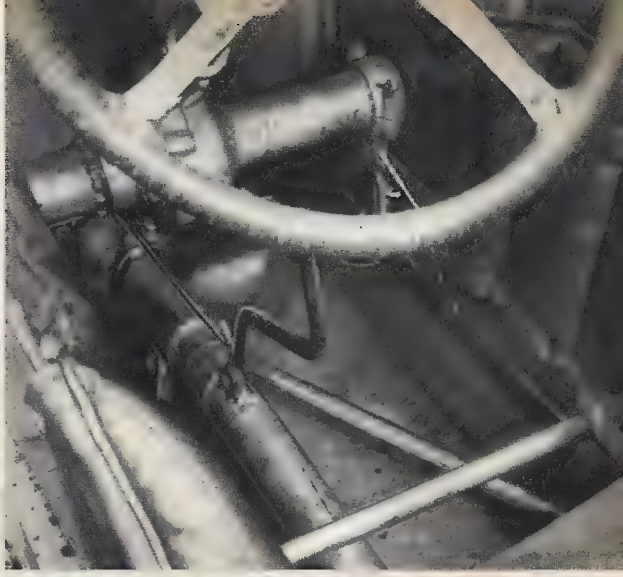
Joe Garson and Ernie Gesel, leading Eastern point scorers, do it with 60 horsepower outboards. Johnny Peterson, who is no man's stooge on the raceways burns up the tracks with an 80 horsepower J. A. P. (specially built English motorcycle engine designed for racing). Garson's and Gesel's engines wind up terrifically; have tremendous top speed, as well as pick-up, and on a straightaway these drivers make the others seem to be standing still.

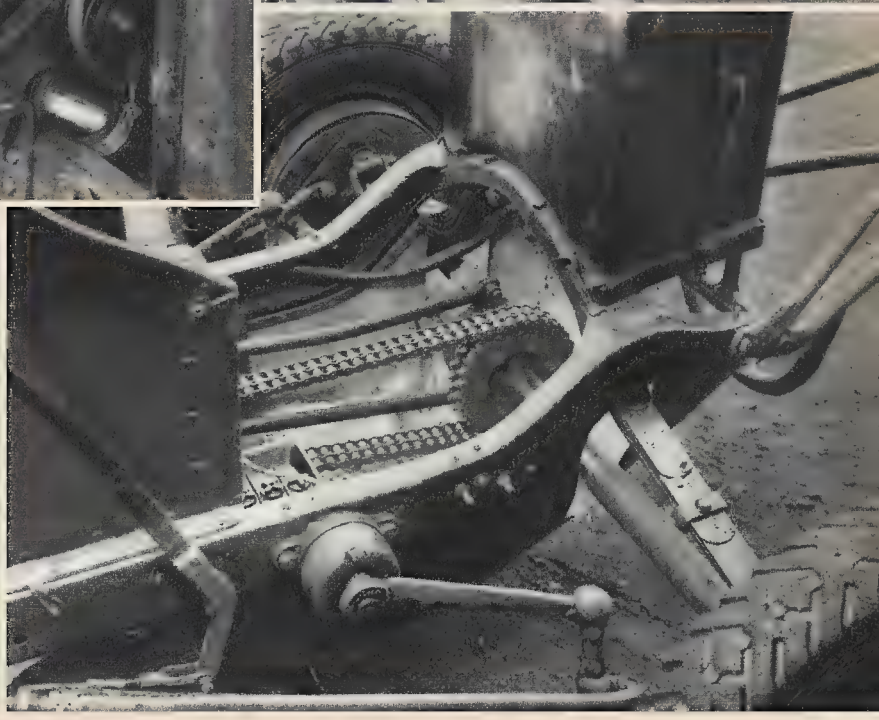
But the presence of Gesel, Garson and Peterson; of Jimmy Schneider, Duke Nolin



Next to the powerful Offenhausers, an outboard motor is considered the fastest on the midget race tracks. They wind up terrifically, have tremendous top speed and pick-up. This 60 hp. outboard in Bob Meyers' racer keeps him in the money.







There's at least one small V8 on every track. This motor spills over the sides of the midget, but can do better than 100 m.p.h. with a change in compression gearing.

The cockpit of the midget (top right) is stripped of absolutely everything but a dog-clutch stick which the driver straddles.

Right: Showing the rear axle arrangement for the only chain drive racer on Roosevelt Raceway's track. It's the brain-child of John Swier.

or Ronald Householder with their outboards and J. A. P.'s doesn't discourage the hundreds of young racers who someday hope to be at the top. John Swier, for instance, who drives a 90 horsepower motorcycle engine with a chain drive, keeps up with the best of them. His is probably the only chain drive on the Eastern tracks and he claims for it good pick-up and plenty of power on the turns. It also saves weight, he claims. What his fellow track mates think of the chain drive isn't fit to print but it's just this difference of opinion that makes midget racing what it is. For instance, Jack Yisitis (pronounced Yes-it-is) swears by his Vanlert 16-valve, single-overhead, 97 cu. in., 100 horsepower engine which he claims has been clocked at 130 miles an hour, unofficially. Among other things, he also swears by his tubular front axle and elbow-type dampers. Swier, on the other hand, took out the front axle and uses eliptic springs to which the wheels are suspended to pitch in or out, depending on which way he is turning. Swier claims he can take turns better with this arrangement and as long as he continues to finish up among the leaders, he'll stick to his story.

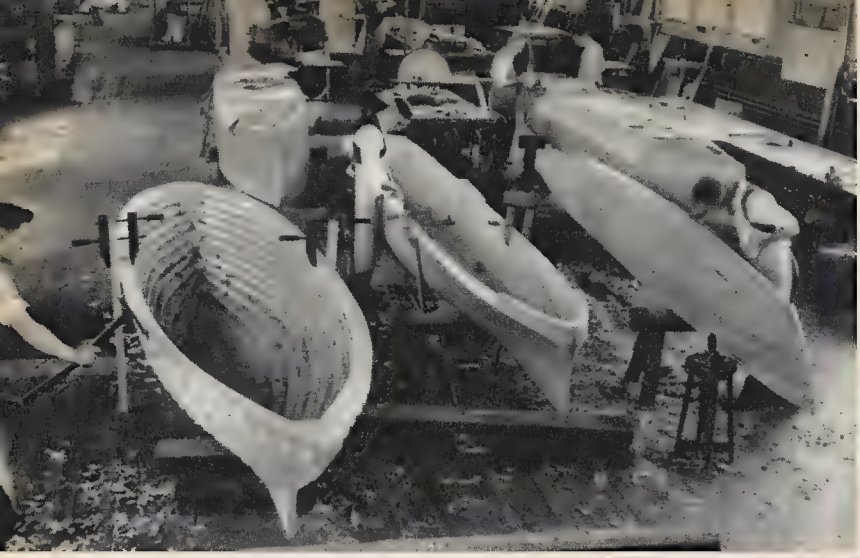
[*Continued on page* 118]

New English Ocean Liner Will Be World's Largest

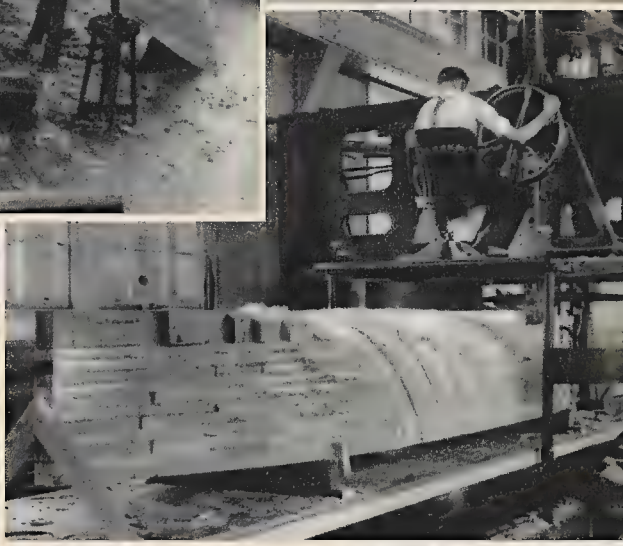
DWARFING the destroyers in the foreground, the hull of the Cunard White Star Line's newly projected passenger ship *Queen Elizabeth* makes an imposing picture in a shipbuilder's yard in Scotland. When completed in 1940, the new vessel will be the world's largest with a length of 1,030 feet, 10½ feet longer than the *Queen Mary*.

Portable Darkroom Is Practical Photo Aid

CONTAINING 14 items including trays for developing and fixing, negative and paper holder, etc., a newly developed portable "darkroom" outfit enables a photographer to do darkroom work anywhere in broad daylight. The "darkroom" consists of a compact box fitted with flexible light-proof sleeves through which the user can insert his hands to get at the materials within. By looking through a glass in top, the photographer sees his hands, trays, etc.



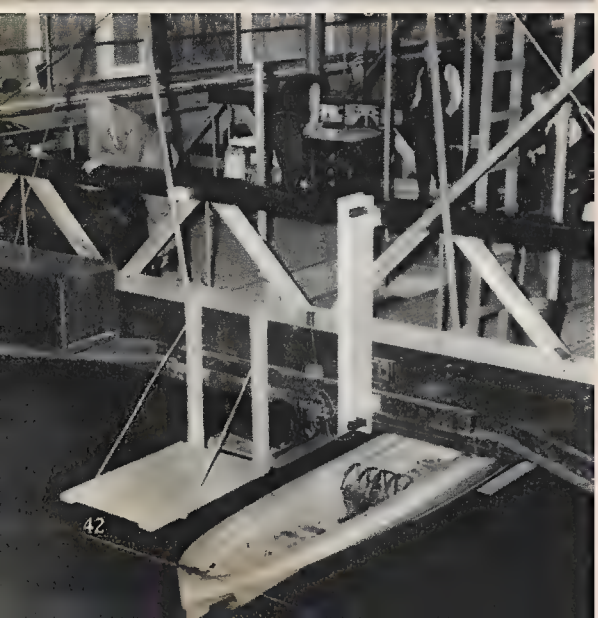
Left—View of the interior of the Naval Experimental Basin in Washington, D. C., showing wooden scale model battleships in various stages of construction. Below—A huge mechanically operated plane is used to smooth down the outer hull surfaces of the miniature warships. The workman controls the scraper.



Shown below is the Experimental Basin's mammoth towing machine, which is used to move the scale model hulls through the water at varying testing speeds.

Building TOMORROW'S WARSHIPS In Miniature

Below—The fully smoothed hulls are lowered into a water basin in which every type of sea condition can be simulated to test the hull's reaction to waves.



THE steel monsters that make up the fighting fleet of Uncle Sam's Navy are the result of painstaking research by designers, engineers, draftsmen, ordnance experts and scientists. Long before plans are approved for an addition to the fleet, the blueprints of the new vessel are drawn up, improvements and changes carefully thought out with due regard not only for the effect on the vessel itself, but also with an eye on its potential usefulness as a permanent addition to battle efficiency. Once the plans have been approved, skilled carpenters carefully create scale models in wood, so that scientific tests can determine exactly how a fully developed steel ship will handle when constructed.

Gigantic Sieve Clears River

REMOVING silt and debris from Colorado River water on the California side of Imperial Dam is the purpose of the gigantic iron sieve-like structure shown above. Relieved of its great burden of silt, the water then begins an 80-mile journey to irrigate the Imperial Valley in California. Construction of the dam was completed last July.

"Iron Lung" Goes Quadruple

INSTALLED at the Children's Hospital in Boston, Mass., a newly developed "iron lung" chamber accommodates four patients at one time, as shown above. Because of its special construction only one air pressure unit is required to operate the four respirator compartments of the chamber, thus reducing the cost of treatment per patient.

Negative Viewer Aids Photography Fans

AN ATTRACTIVE film slide viewer which has been placed on the market by a well known optical firm enables users of miniature cameras to study negatives for enlarging possibilities or to exhibit them to best advantage. The ground glass diffusing screen of the viewer permits the showing of all popular miniature sizes, in black and white, or colored positives. Operating on 110-volt A.C. or D.C. current, the viewer has a well ventilated housing and uses an ordinary 15-watt bulb.

GOLDBEATING — A Passing Art

Goldbeater's skin, used to cover the gold leaf during the beating process, must be conditioned by subjection to trip hammer blows for 40 minutes before use (above).

Above—Gold leaf, placed between sheets of goldbeater's skin, is hand-hammered for 8 hours until it is about 1/282,000 of an inch in thickness, as shown at right.

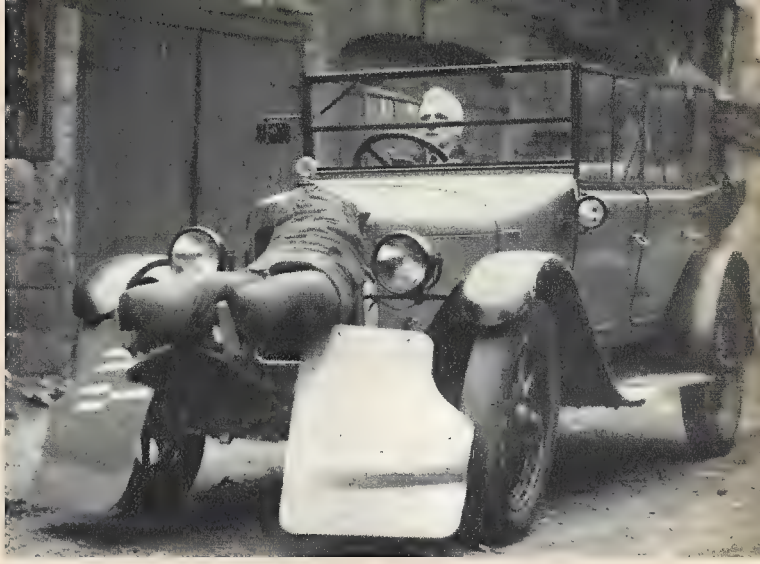
Machinery is used only at the start of the goldbeating process. The gold is flattened into ribbon form between rollers of a press, as shown in above photo.

GOLDBEATING, a hand process whereby one ounce of pure gold can be beaten into enough leaf of a 1/282,000-inch thickness to cover an area of 85 square feet, is gradually becoming a passing art. Limited demand for pure gold leaf, the development of a cheap gilt substitute, and the fact that actual beating of the leaf is something that cannot be done satisfactorily mechanically, thus increasing production costs, have sounded the death knell of the industry.

In producing gold leaf, machinery is used only at the start of the process when the pure gold is run between the rollers of a powerful press which converts it into ribbons 30 feet long. Each ribbon is cut up into small flat squares which are then placed between sheets of goldbeater's skin (made from the outside membranes of the large intestine of an ox) and pounded by hand for hours until leaf of the desired thickness is obtained.

New Auto Safeguard Protects Pedestrians

THIS automatic safeguard for use on automobiles, to protect pedestrians, is the invention of David Keith, of Birkenhead, Cheshire, England. When the car strikes a person, the device tilts back, lifting the person onto the car instead of running over him. The photograph shows a dummy being lifted off the road in a test. The invention is to be given thorough tests by the Ministry of Transport.



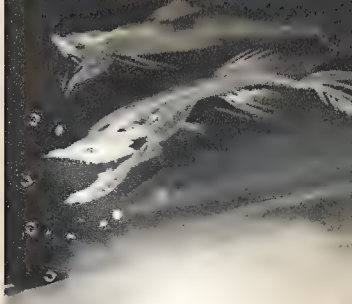
MI Boat Starts On Trip To South Seas

BUILT from MI plans of the 30-foot ketch *Tahiti*, the *Nahrah* now is on its way toward the Marquesas, 4,500 miles away from its home port, San Francisco. The craft was built by Arved Littchen, and its itinerary, to take one to three years, includes the Lower Tuomotu Archipeligo, Monga Reva, Society Islands, and Samoa, including all the French Polynesia.

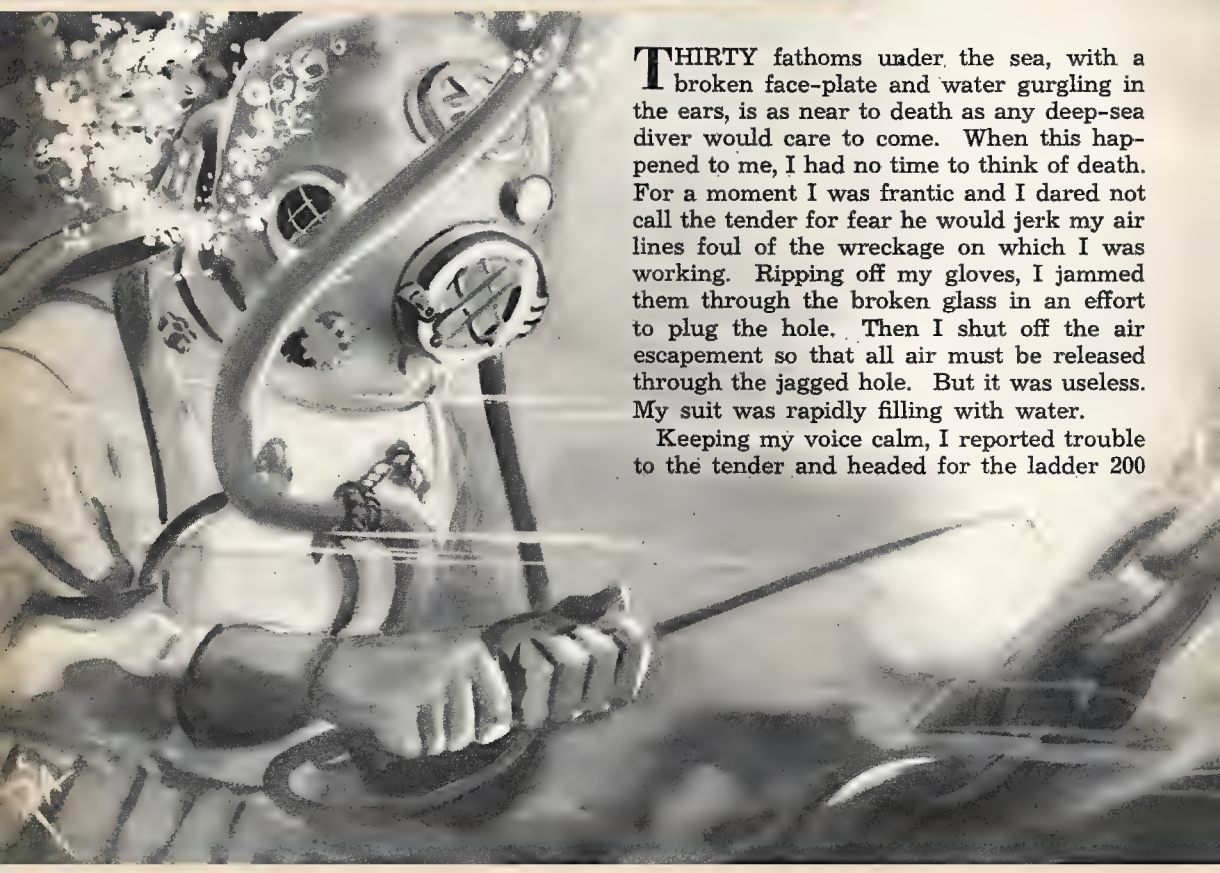
Besides Skipper Littchen the crew consists of Ted Martine and Joe Lais. The *Nahrah* carries two tons of supplies.

Swamp Buggy Uses Airplane Propellers

THIS "marsh buggy" or "swampmobile" travels on land or water with equal ease and receives its motive power from two airplane propellers of the pusher type. Carrying a crew and equipment, the "marsh buggy" travels along the swamp bank dropping off pipes, etc., at the correct points. On land, the four large tanks act as wheels. A top speed of thirty miles an hour is claimed for the craft.



Left: Two salvage tugs above a sunken steamer lowering a diver to inspect the ill-fated ship.



THIRTY fathoms under the sea, with a broken face-plate and water gurgling in the ears, is as near to death as any deep-sea diver would care to come. When this happened to me, I had no time to think of death. For a moment I was frantic and I dared not call the tender for fear he would jerk my air lines foul of the wreckage on which I was working. Ripping off my gloves, I jammed them through the broken glass in an effort to plug the hole. Then I shut off the air escapement so that all air must be released through the jagged hole. But it was useless. My suit was rapidly filling with water.

Keeping my voice calm, I reported trouble to the tender and headed for the ladder 200

DARING DEATH for

Right: Tanker aground and breaking up in the heavy seas. Divers salvage its valuables.

"I have covered the ocean bottom from Alaska to Mexico," says

Charles E. Smale

who tells of his experience 30 fathoms under the Pacific.

feet away. I remember reaching the bottom and starting up, rapidly losing consciousness. The water-filled suit lost its buoyancy and confined my movements like an iron straight-jacket.

As I neared the top, the water in the suit rose over my mouth and nose. Searing pains shot through my chest from suffocation. My movements were but mechanical as the energy drained from my spent muscles. But with a final burst, I reached the deck, aided by a boost from the tender, and lay there, water-logged, just dimly conscious.

That was my first crucial experience as a deep-sea diver. Since then I have spent more than 10,000 hours under water. I have seen silver coin piled knee deep on the bottom of a sunken gambling ship. I have pulled bodies from airplanes 150 feet under the surface. I have dredged for gold on river bottoms, salvaged steamers, worked on underwater construction and have worked as a "double"

UNDERWATER GOLD

The diver above is ready for a plunge to the ocean bottom where gold or death awaits him. Pressure pump below supplies air—60 pounds at 100 feet.

in seven motion pictures. I have suffered the paralysis of the "bends" and I have seen men writhing on the deck, spurting blood from ears and nose as a result of a "squeeze." But I find deep-sea diving the most fascinating work in the world.

It is also probably one of the most dangerous occupations. I've often felt my ear drums pop outward when lowered too quickly into deep water without proper regulation of inside air pressure. And inexperienced divers, shooting to the bottom without proper adjustment of air, suddenly find their circulation cut off below the protection of the helmet and breastplate, the intense pressure of the cold water forcing their blood into the chest and head. Sometimes quick action saves them; more often the blood bursts from mouth, nose, and ears, with almost instant death resulting. This condition is known, in diver's parlence, as a "squeeze."

Once on the bottom, the air pressure is increased to a point where it lifts the weight of the gear from the body, reducing the weight of the body in the water to about 40 pounds. It is this pressure, plus sudden decompression, that causes the dreaded bends.

"Bends" are the direct result of too much nitrogen in the blood-stream. When working at a depth of 100 feet, 50 pounds of pressure are required to force air down to the diver; ten more pounds are required so that the diver can breathe. Breathing under this pressure naturally forces an excess supply of oxygen and nitrogen into the lungs. The lungs can take care of the oxygen, but the nitrogen escapes to form a tiny gas bubble in the blood-stream.

Under ordinary decompression, it requires 45 minutes to raise a diver who has been working for an hour in 100 feet of water. Half of this time is taken on a resting platform at 50 feet, and the constant exercise of the diver on the way up drives off the nitrogen. But when the decompression is taken too fast, the size of the bubble increases as the pressure lessens, finally attaining a large enough proportion to stick in an artery, thus cutting off the blood supply and causing paralysis. If it lodges in the heart, it means death.

When decompression chambers are not included in the equipment, a man with the bends is immediately returned to the water under the custody of another diver until he revives.

I suffered the bends once—with neither decompression chamber nor diver available. They pulled me to the deck, and my legs crumpled under me. I lay there, paralyzed

from the waist down. I could hear them planning to throw me back—to take a chance on regulating my air supply until I recovered. I felt that death had caught up to me at last. I protested weakly, more weakly, and then fainted. I awoke on the floor of the ocean. Spent? Yes—but happy and thankful.

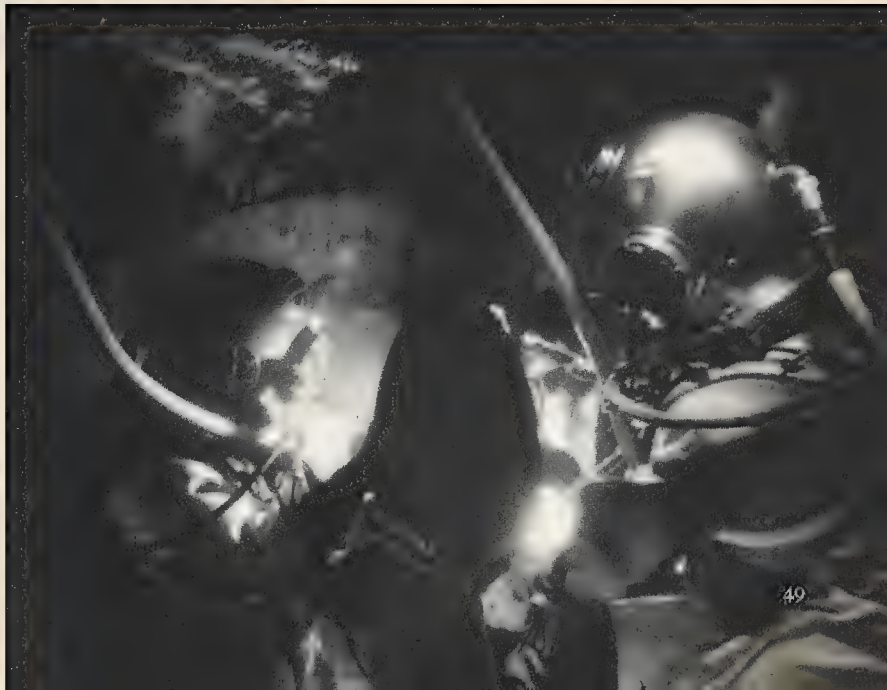
It's things like that which cut down the average man's length of time in actual diving service. There are about 100 divers in the United States; few of them have seen over five years service. A flat rate of pay amounting to between two and three hundred dollars per month with a bonus of seven dollars per dive is not enough to keep most men in the business when life balances on the other side of the scale. It is the variety and thrill that keeps me in the service.

Doing salvage work, I have covered the Pacific coast from Alaska to Mexico—perhaps diving 20 feet to raise a tug in San Francisco one day, then by plane to Seattle to dive 150 feet to patch up an ocean liner on the next.

The larger liners present difficulties. As a rule, we usually find them sunk in deep water with jagged holes in their sides that must be patched before they can be raised. To pull a diver down to their depths, modern diving equipment is necessary. This gear weighs about 240 pounds and usually consists of a heavy spun-copper helmet and breastplate, a canvas suit, an 80-pound belt, and two 14-pound sandals for the feet. When it is necessary to carry tools, a pair of overalls with pockets, known as "chafing pants," is worn.

A downward trip into 150 feet of water re-

Above: Getting into a diving suit is a tough job. Four men are needed to handle the suit and life lines.



Right: Deep sea divers have learned to use electric torches, grappling irons and other mechanical tools to clear away steel doors behind which may lie glittering gold, silver or other valuables.

quires about five minutes, oftentimes more. As the diver slides down the line, he gradually increases the air pressure within the suit to offset the increased outer pressure of the deeper water.

The rush of air into the suit is controlled from a valve at the waist; stale air is forced out through a spring-set escapement valve in the rear of the helmet. Air escapement can be set in emergencies by pressure of the diver's chin against a button conveniently located inside the helmet.

Dressed in this weird outfit, the diver pushes his way along the bottom of the ocean with an electric cutting torch to cut smooth the jagged edges of the hole torn in the ill-fated ship. Inch by inch the torch cuts into the heavy steel. The heat of the electricity creates a fog of steam around the flame as it cuts into the metal —the force of the air in the torch p a r t i n g the metal like melted cheese.

Then comes the patching. On large jobs, bolt holes must be cut all around the gap. Then a wooden frame, lined with canvas and p a d d e d to conform to the contours of the ship's side, is lowered and b o l t e d into place.

This done, the ship is made air-tight. Water suction pumps on the barges above are set to work pumping out the water in the hold, at the same time sending down air to increase the buoyancy of the ship. And as the air enters, slowly, very slowly, the ship rises to the top to be hauled to the drydock for repairs.

This salvaging work is expensive. Sometimes it takes a year to raise a single ship, thus saving an investment of millions of dollars. But few projects have entertained me more than going down after a paltry 40,000 dollars which sank with the *Mt. Falcon*, a gambling ship anchored off the coast of Los Angeles.

The ship was sand ballasted and sat erect on the bottom. On the upper decks, the coin fell from the tables to the sand in the hold. In some places, the coin was piled three feet high, glinting slightly in the murky light cast by our electric safety lights. That was one time when I almost regretted the fact that they did not put pockets in diving suits!

We picked up what money we could see on the sand and then applied suction pumps to pull the sand on the deck, where they sluiced it, salvaging 98 percent of the total that went down with the ship. It's things like that which make life interesting.

Although I have had many interesting experiences as a deep sea diver, my first experience under water remains with me as something I will never forget. The first time a face-plate was snapped shut before my eyes to make my diving suit water-proof, I felt a lost, sinking sensation—as though absolutely cut-off from the rest of the world. People walked around me laughing, joking and slapping me on the back. And I stood sweltering in a 240-pound diving suit, alone, miserably waiting for the signal to go over the edge and down under the surface.

Finally it came. Clumsily, I maneuvered my 14-pound i r o n sandals onto the ladder. Cold water pressed the canvas suit close to my body. A weird, gurgling s o u n d came to my ears as the air left the rear escapement valve and swiftly bubbled to the top. I stood alone in a new world of water, sand and seaweed — 10 feet below the surface. All was silent except for the rushing stream of air bubbles. Shadowy forms of startled fish darted off into obscurity. And I was afraid. I vowed that this would be my first and last trip under. That was 15 years ago.

Since then I learned the secrets of diving, and that the first law in diving, as in other work, is never to take chances. But even when exceptional precaution is taken, there are times in the career of every diver when the question of what to do means life or death.

A diver never knows what his next job will be. It may be a treasure hunt or it may be a simple repair job. In either case it may mean death. One very close friend of mine had his helmet knocked off when he was jammed under a pipe line by a cave-in. Another died of the bends while working on the Golden Gate Bridge in San Francisco. Who knows, I may be next? It may be on a hunt for Captain Kidd's lost gold. It may even be in bed!

Blind Man Invents "Polycord"

PLAYED with the fingers of both hands, a new musical instrument known as a Polycord, resembles two harps set side by side. The instrument has 61 strings on one side and 56 on the other, and is said to substitute the tone of four harps while its construction offers distinct advantages over both piano and harp. Evangelos Tsamourtzis, a blind Greek musician, invented the Polycord.

Clutchless Auto Passes Test

A CLUTCHLESS, gearless automobile, the dream of engineers for more than a quarter of a century, is said to have been successfully demonstrated in Cambridge, England. The test car, an ordinary type, was equipped with a new type of transmission which can also be adapted to the motors of buses, trains and ocean liners. The photograph shows the test car in operation.

De Luxe Trailer Requires Specially Built Tow Car

TOWED by a specially built auto with a wheelbase of 117 inches, which features eight forward speeds and a two-speed rear axle, the luxurious trailer shown above is owned by William Woods Plankinton, wealthy sportsman. The interior of the trailer, which resembles a private railroad car, provides sleeping quarters for two persons, a radio, heaters, closets and a kitchen with a refrigerator and running water facilities.

10,000 TREES in a

Tree dwarfing has been practiced in China for 2,600 years. The process is so closely guarded that James F. Craven experimented with more than 100,000 trees before he discovered the secret. How he dwarfs giant trees is told in this story.

by

Annie D. Nunn

This dwarfed orange tree bears miniature, full-grown, ripe fruit. Note how the cut fruit compares in size to the normal size orange.

IMAGINE a forest of 10,000 of the mightiest and most majestic trees in this country confined in a nursery 15 feet square!

That's the achievement of James F. Craven, of Glendale, Calif., magician-scientist, who dwarfs trees by a secret formula. He has miniature oaks, redwoods, maples, pines and the famous California sequoias that are 15 years old and less than 9 inches high, which, if allowed to grow normally, would be 100-foot giants.

Imagine grapefruit the size of golf balls and oranges the size of marbles; roses the size of a thumbnail and giant shrub plants that grow in flower pots! This is the story of the scientist who defies nature; of modern man who has wrested the secret process from the unfathomable Orientals who have been dwarfing trees for 2,600 years. Their closely-guarded secret has not only been discovered, but actually improved upon.

The practice of dwarfing trees was prevalent hundreds of years ago and today Japanese families, especially, possess at least

15-Foot NURSERY

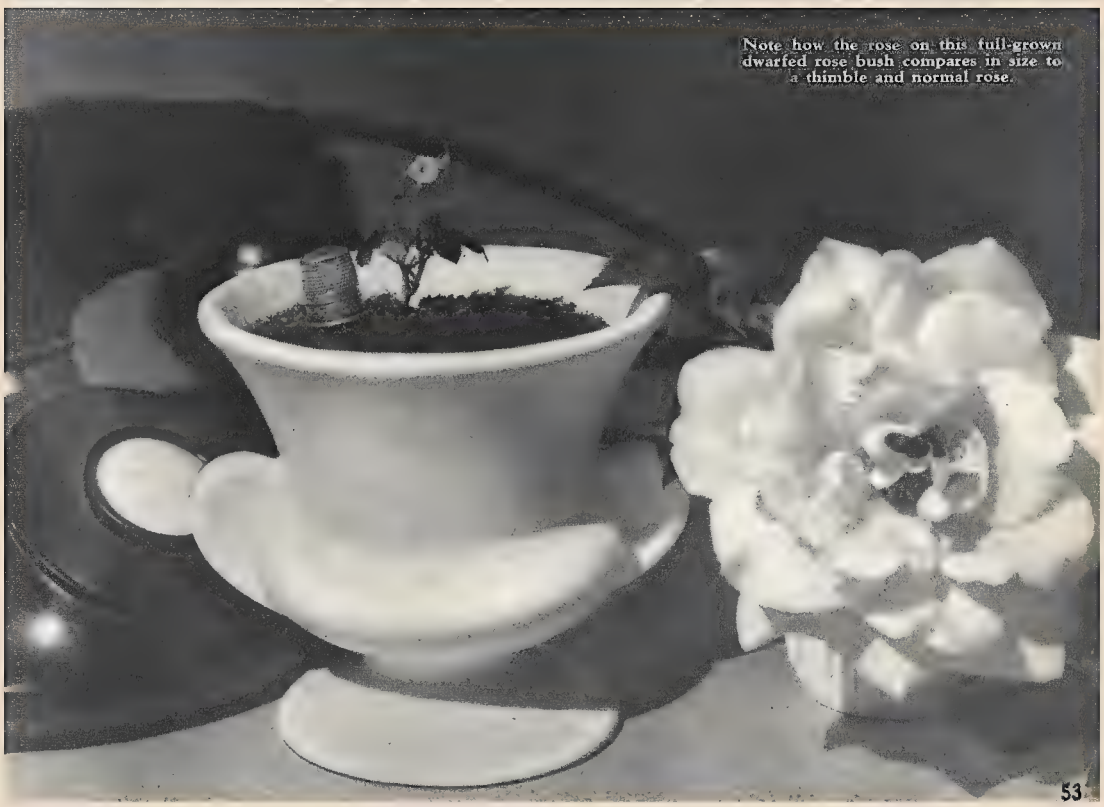
one dwarf tree each. Some of these trees, handed down from one generation to another, live hundreds of years and are literally "family trees," since, artificially trained as they are by weights of various sizes, they record family records for every branch and every marking has a particular meaning. The Chinese taught the art of tree dwarfing to the Japanese, but they, in turn, kept the process a dark secret. But undaunted, scientist Craven experimented with 100,000 trees or more and finally succeeded in dwarfing one to his satisfaction. His method is an improvement over the Oriental method, in that his tree, *after having once been treated by his secret process, stay dwarfed,* while those produced by the Japanese must be treated from time to time to retard growth. Then, too, Mr. Craven dwarfs all kinds of bark forming plants. The Japanese have been successful with only the cone bearing trees.

"A tree must show its age to be interesting," Mr. Craven told me recently, "and there is no way of faking age, since trees take on markings only with the passing of time. He held up a venerable fir tree 7 inches tall. There was no mistaking its age. It had knarled, twisted limbs, a thick trunk and heavy bark. It was also loaded with fully developed cones no larger than the head of a pin!

We walked about the grounds of Mr. Craven's home, where numerous astonishing specimens of years of valuable research are tucked away. Mr. Craven pointed to a tiny rose bush that grew in a shallow bowl in a secluded spot. "It is the same with shrubs and vines," he said. "Notice, for instance, the ruggedness of this bush which is 9 years old and but one and a fourth inches high.

"Why, it's covered with roses!" I exclaimed. "Roses no larger than my little finger nail!"

Mr. Craven extracted a magnifying glass from his pocket. "Take this. It will give



Note how the rose on this full-grown dwarfed rose bush compares in size to a thimble and normal rose.

The dwarfed giants above are: (1) Sequoia, 7 years old, 3 in. tall; (2) Pinus Montana, 8 years old, 3 in. tall; (3) Pine, 10 years old, 3½ in. tall; (4) Cembroides Pine, 15 years old, 8 in. tall; (5) Cryptomeria, 6 years old, 6 in. tall.

Left: James Craven is shown inspecting a rose bush several inches high. This "giant" plant blooms from January until late fall.

you a better view. This bush blooms from January until late fall."

I took the glass and held it above the incredible little bush. Its roses were fully grown and perfect in every detail. Then he showed me a 7-year-old naval orange tree, 18 inches high. Its oranges, which were the size of a medium marble, were well developed and as well flavored as the average orange. He has had citrus trees to bear at the age of six months. A diminutive grape vine had sweet juicy fruit in clusters a little over an inch long.

By treating the seed before it is planted, Mr. Craven can predetermine the height of a tree. He can also produce in miniature, replicas of trees of normal size, giving them the identical form, shape and number of branches. He does it by treating the cambrium layer, that life giving, bud-filled organ that lies between the bark and the wood of the tree. This is done when the tree, previously dwarfed, is from one to two years old.

"There is nothing magical about all this," said Mr. Craven. "It is done scientifically, by following the laws of nature. For instance, after trees are dwarfed they must be allowed to grow naturally, because the crown and the

The dwarfed, fruit-bearing orange tree is shown beside its full-grown counterpart, at scientist Craven's nursery.

roots should have definite balance with relation to each other."

Paradoxically, Mr. Craven can produce a dwarf tree which is actually 20 years old, within one year! He does it by treating the cambrium layer of a branch on a normal tree, known to be 20 years old, which has been selected to be the new dwarf tree. This develops the root buds in the cambrium layer of the branch. If properly protected from air, and kept moist, in 6 months the root buds will grow into a perfect root-system on the outside of the bark of the branch while it is still growing on the tree. Then he cuts the branch from the mother tree, with the roots it now possesses, dwarfs the new tree and plants it. The tip of the branch may be cut off, if desired, to get the heavy bark on the trunk of the dwarf. For convenience many of the dwarfed trees are kept in flower pots. I inquired whether this had anything to do with the size of the trees.

"Nothing whatever," he replied, "as trees from seeds which I have treated cannot obtain normal size no matter where they are placed."

Thus it is not unusual to find Mr. Craven's trees growing in bowls, pans, basins and as well as in flower pots and even in the open soil.

Most of the experimental work on tree culture is done in his nursery which is about 15 feet square and contains some 10,000 tree seedlings at present. It is the smallest nursery in the world! And behind its closely guarded door he often sacrifices 20,000 seedlings in one experiment. By such extensive experimenting, positive results always are obtained.

"As novelties, dwarf trees are interesting," said Mr. Craven, "but the object of my experimentation has a more practical angle, one that may in time be of immense value to the public. Having discovered the secret of dwarfing trees, I am now working on the reverse idea—the rapid development of the root system of normal trees to speed up their growth."

After experimenting with 15,000 seedlings, seedlings were produced which had roots 48 inches long in a year's time. This root growth would normally require 4 to 6 years in open soil. Twenty-five to fifty thousand of these plants may be grown in a nursery 15 feet square. After being transplanted at the end of the first year, they will reach maturity in about half the time that normal trees do, claims Mr. Craven.

The history of the world is replete with strange stories of scientists whose dreams it was to speed up or slow down growth of human beings. But like the story of the alchemists who strived to learn the secret of making diamonds in the laboratory, their efforts proved futile. But now that the skill of science has begun to produce modern wonders in the natural world; to enclose the secrets of the soil in a bottle of chemicals, fantastic dreams of men once thought mad may yet come true.

"Claws" Aid Berry Pickers

BERRY pickers near Heron, Montana, have developed canvas "catchers" and "claws" which simplify their job and enable a fast worker to fill 50 one-gallon tins daily. The catcher is held under the bush with one hand while the other hand wields the claw to beat the bush free of berries.

Motor Built For Wind Tunnel

DEVELOPED for use in a new wind tunnel to be installed at Massachusetts Institute of Technology, the 2,000-horsepower four-speed electric motor shown above will whirl a huge propeller to create winds of a 400 M.P.H. velocity. The tunnel will be used to conduct tests on model airplanes.

Lightweight Self-Contained Helmet-Suit Has Many Uses

A NEW all-purpose helmet-suit with a self-contained breathing unit can be used for aerial work in rarified atmospheres, deep sea descents and fighting fires, smoke and gases. Developed by Jack Browne, of Milwaukee, Wis., the suit is made of rubberized fabric and weighs only 100 pounds, including a spun-brass helmet, lead chest weight, lead-soled shoes and steel cylinders containing oxygen and air.

Rollers Curve Steel Sheets

OPERATING in the manner of the familiar home washing machine, a huge roller press installed in the plant of a well known electrical products manufacturer rolls sheets of heavy steel into a cylindrical shape. The sheet shown above will become a tank body for a large oil circuit breaker.

Table Lamp Holds Magazine

DESIGNED to hold a magazine at a convenient angle and to flood the printed page with a soft diffused illumination, a new read-while-you-eat lamp has recently been placed on the market. The light emanating from a 75-watt bulb is diffused by an opal glass bowl inside the lamp's reflector shade.

Waterproof Roofing Formed As Interlocking Slabs

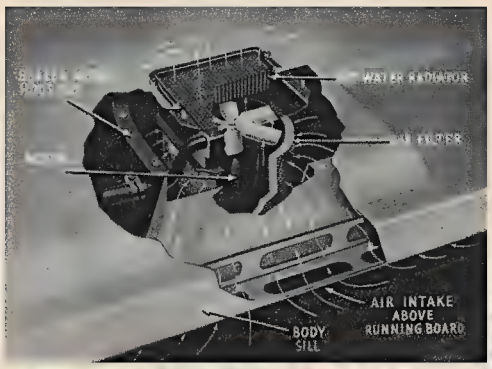
NO HEAVIER than an ordinary asphalt shingle roof and claimed to possess excellent insulating properties, a new type of roof consists of interlocking slabs made of a mixture of water-proof cement, crushed slag and treated sawdust. Developed by Raymond Meredith and Lief W. Andersen, of Annapolis, Md., the roofing sections are formed in an open pan mold and are applied directly upon the rafters of the roof without the use of sheathing. The sections are three feet long, two feet wide and five-eighths of an inch thick and are made waterproof through an application of an asbestos cement.

Second MI Movie

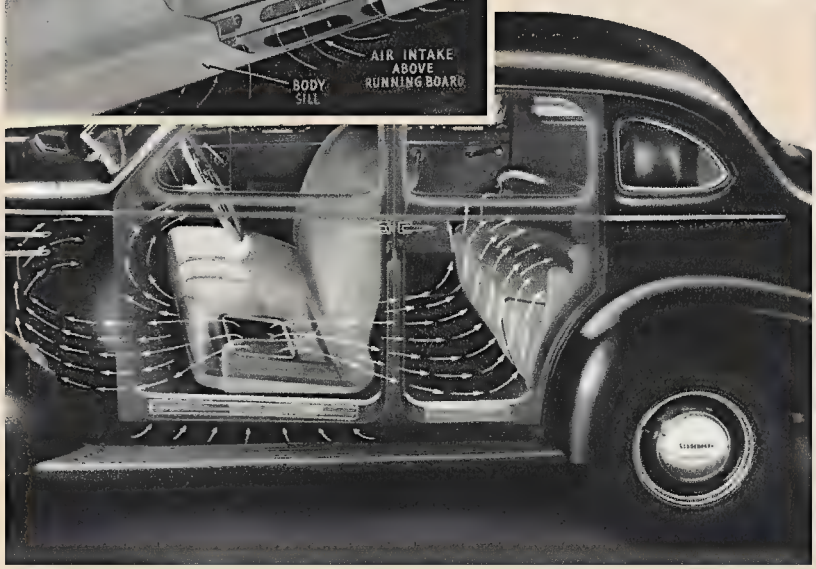
Here are some scenes from the four interesting sequences that make up the second MECHANIX ILLUSTRATED-Vitaphone movie. Don't fail to see the full reel at your favorite theatre. Top: Behind the scenes for the first time in the television studio of the National Broadcasting Company, Radio City; the mysteries of "seeing by radio" made clear at last. Left, above: Do you know what happens when you ring a fire alarm? The famed New York Fire Department staged a spectacular rescue to show how fire fighters work. You'll be thrilled by this exciting sequence. Left: Ira Genet, Warner Bros. director (in shirt sleeves), watches the firemen in action "on location." Right: Vitamins play an important part in health conservation. The MI movie takes you into the laboratories of the U. S. Vitamin Corp., New York, and shows how they are analyzed and prepared. Below: Dr. James H. Kimball, of the U. S. Weather Bureau, demonstrates and explains weather forecasting instruments.

Remote Control Gear Shifting in 1939 CARS

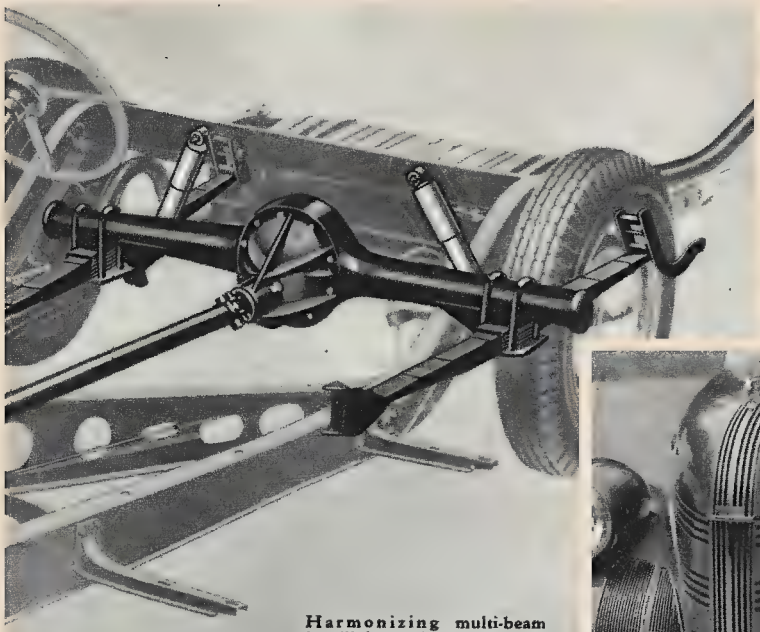
RICH appointments and many mechanical improvements make the 1939 automobiles more beautiful in appearance and more economical and comfortable in operation than ever before. The outstanding mechanical trend is adoption of remote control gear shifts by practically all manufacturers, a few of whose latest models are described briefly on this and following pages.



The gear shift lever of the 1939 De Luxe Plymouth is mounted on the steering post (left, above) and the hand brake is at the driver's left, providing unobstructed floor space. The instrument panel has no protruding knobs to menace passengers in case of sudden stops. Above—The clean-cut, non-angular front end of the beautiful new De Luxe Plymouth.

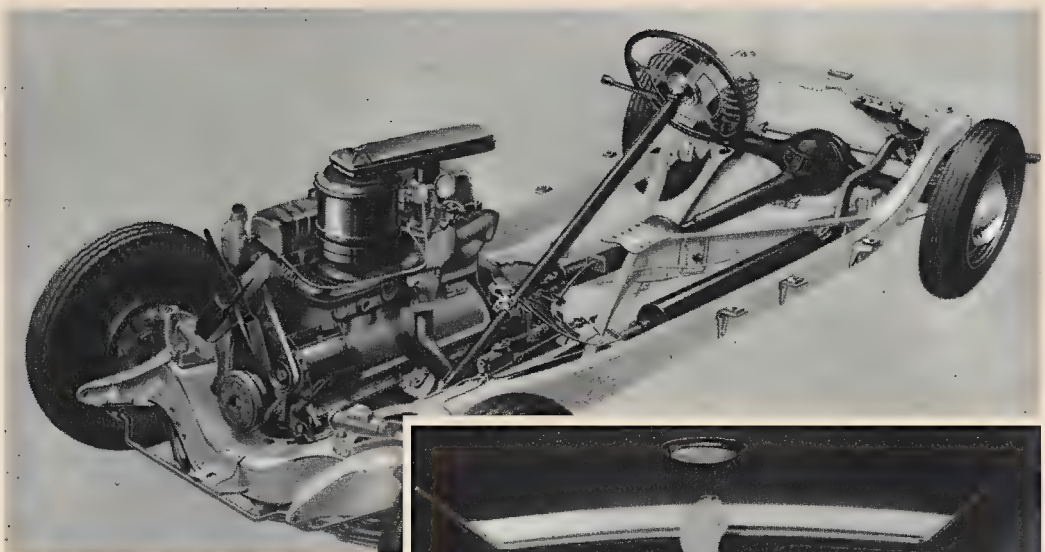


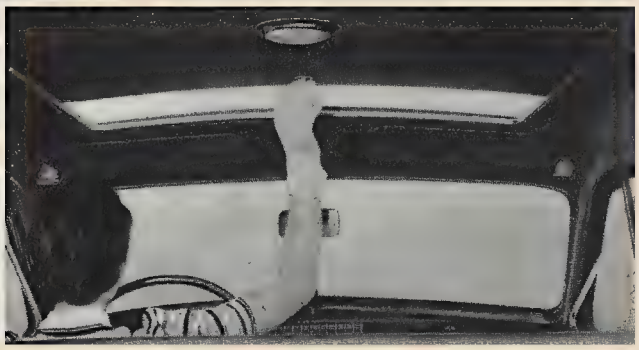
The Studebaker automobiles for 1939 feature a high capacity heating, air filtering and ventilating unit which, positioned beneath the front floor pan (left, above), draws outside air from above the running board. The air is drawn through a passage formed in the body and is then filtered to remove dust before passing through the core of an efficient heater to emerge from a special vent located under the front seat, as shown in left diagram.



Important mechanical improvements, modern streamlining and rich appointments are offered in the new Pontiac models. At left is the Duflex rear springing, hypoid rear axle and inclined shock absorbers which provide a cushion-power ride. Below —Chromium grilles flank the Pontiac's radiator with its famous Silver Streak motif which runs over center of the hood.

Harmonizing multi-beam headlights are mounted on the front fenders of the new Pontiac (right). The radiator ornament serves as the locking handle to raise the alligator type hood for inspecting engine.

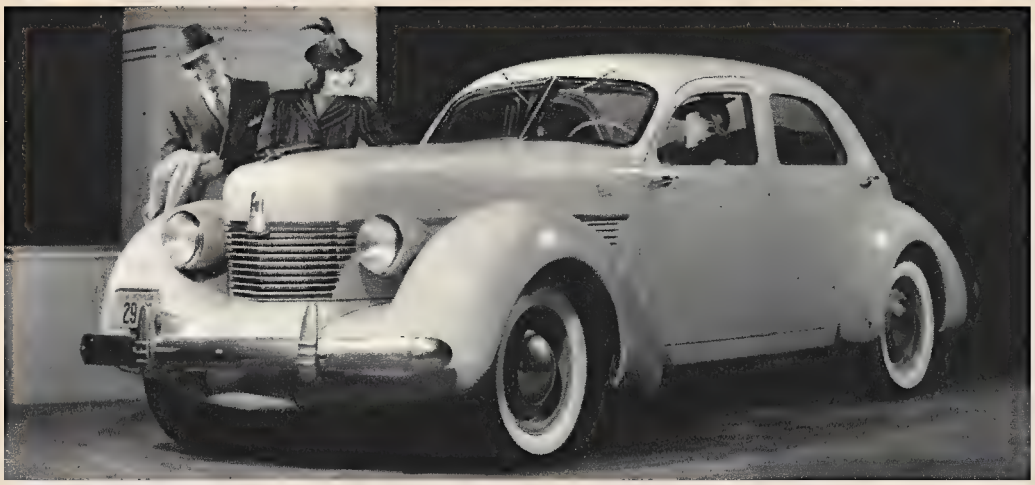




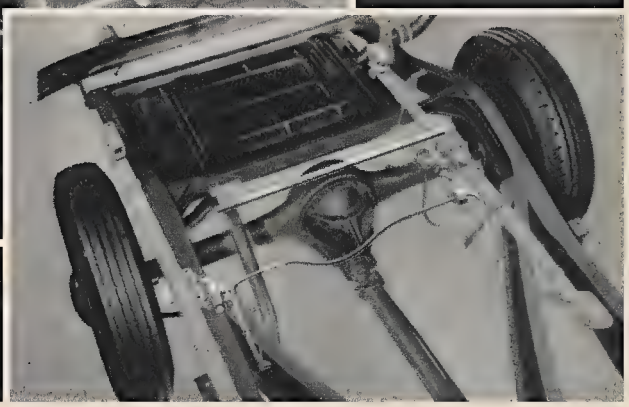
The new Buick appears lower and longer, an effect achieved by improvements in chassis design (above) which materially lowers the car while maintaining a flat floor without a tunnel. Many of Buick's new models feature a "Sunshine Turret Top," which can be opened as shown at right. The movable panel does not effect the top's highly rated structural strength.

For 1939, the American Bantam Car Company enters the four-passenger field. Pictured at the right is the company's sporty "Speedster 60" model.

Below—Ultra-modern lines which create a rakish appearance are shown in the 1939 Hupmobile models. Gear shift is on steering column.



A "Turret Top Sunshine Roof" is an optional feature on the 1939 Cadillac (left) and La Salle sedans. The easily manipulated sliding panel provides the fresh air and sunshine advantages of convertible models to closed car bodies.



More beautiful than ever, the 1939 Packard models boast improvements designed to provide added comfort, driving ease and longer life. Shown at right is the new Packard fifth shock absorber system which suppresses sidewise or transverse road shocks.

MI Readers'

IF YOU fail to read the advertising section of MECHANIX ILLUSTRATED you are cheating yourself of learning about many valuable opportunities, for advertisers spend thousands of dollars yearly in producing interesting booklets on a variety of subjects which can help you to secure training for a better paid job, make your home more comfortable and attractive, simplify the problem of automobile maintenance, improve your health, increase the scope of your home workshop activities, etc.

To bring these opportunities to your attention and to simplify your obtaining information from the advertisements that interest you, all the offers made in this issue, with the exception of those in the classified section, are listed on this and the opposite page. Study the list carefully.

It is the function of the Readers' Service Bureau to act as a clearing house for both readers and advertisers. The listing gives offers made, the cost of each, and a convenient identifying number. To simplify the ordering of booklets, samples, catalogs, etc., the bureau will forward your requests to three, or less, of the firms listed.

To take advantage of this service, merely write your name and address on the coupon, mark the numbers of the offers wanted, and mail the coupon to: Readers' Service Bureau, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y. We will do the rest.

If the offer selected is listed as "free," all you have to do is to send in the correctly marked coupon. If there is a slight charge (usually only 3c and rarely more than 10c, to cover cost of mailing bulky catalogs, etc.), be sure to include the correct amount with the coupon. U. S. postage stamps are acceptable.

NOTICE

Don't fail to examine all advertisements in this issue and the offer they make. We are willing to forward three of your requests for booklets, etc., but don't let this stop you from ordering additional material directly from other advertisers. REMEMBER — read the advertisements *carefully*.

Offer No.	Firm	Type of Business	Offer Made	Charge	Page
1	A and N Supply Co.	Outdoor Goods	Catalog	10 Cents	26
2	Ace Tool Co	Tools	Catalog, Instructions, Tool	10 Cents	32
3	Advertising Institute of America	Instruction	Book	Free	14
4	Allied Radio	Radio Supplies	Catalog	Free	143
5	American Landscape School	Instruction	Details, Book	Free	122
6	American School	Instruction	Bulletin & Lesson	Free	17
7	American School	Instruction, Air Conditng.	Details	Free	24
8	American School	Instruction, High School	Details	Free	29
9	American School	Instruction, Mech. Engrg.	Details	Free	26
10	American School	Instruction, Diesel Eng.	Bulletin	Free	32
11	American School	Instruction, Drafting	Bulletin	Free	20
12	American School of Photography	Instruction	Booklet	Free	28
13	Charles Atlas	Health Instruction	Book	Free	16
14	Atlas Press	Tools	Catalog	Free	135
15	Bass Camera Co.	Cameras, Supplies	Price List	Free	32
16	Bausch & Lomb	Microscopes	Book	Free	124
17	L. L. Bean	Hunting, Camping Specits.	Catalog	Free	133
18	Benjamin Air Rifle Co.	Air Rifles	Targets	Free	22
19	Boice-Crane Co.	Power Tools	Catalog	Free	130
20	The Book Supply Co.	Books	Catalog	Free	32
21	Brooks Appliance Co.	Health Appliances	Details	Free	26
22	Brownscope Co.	Telescopes	Catalog	Free	128
23	Bild-Ur-Own Devices	Scooter Kits, Motors	Book, Plans	10 Cents	20
24	Casein Co. of America	Glue	Handbook	Free	21
25	Central Camera Co.	Photo Supplies	Catalog	Free	120
26	Chartered Institute of America Invtrs.	Selling Inventions	Details	Free	28
27	Chicago Technical College	Instructions, Air Conditng.	Lesson	Free	28
28	Chicago Technical College	Instruction, Drafting	Lesson	Free	23
29	Chicago Wheel & Mfg. Co.	Tools	Catalog	Free	145
30	Cleveland Model & Supply Co.	Models	Catalog	10 Cents	20
31	College of Swedish Massage	Instruction	Booklet	Free	142
32	Columbian Correspondence College	Instruction, Civil Service	Catalog	Free	14
33	Coyne Electrical School	Instruction, Radio	Book	Free	30
34	Coyne Electrical School	Instructions, Electrical	Book	Free	18
35	The Craftsman	Woodworking Equipment	Catalog	10 Cents	144
36	Crosman Arms Co.	Rifles	Book	Free	126
37	Henry Disston	Tools	Manual	Free	127
38	Dodge's Institute	Instruction	Catalog	Free	20
39	Dremel Mfg. Co.	Tools	Booklet	Free	120
40	Electrical Salvage	Radio Supplies	Catalog	Free	24
41	Electro Torch	Welding Equipment	Details	Free	23
42	Engineer Dobe	Instruction, Drafting	Book	Free	32
43	Victor J. Evans & Co.	Patent Attorney	Books	Free	13
44	Franklin Institute	Instruction	Booklets	Free	33
45	Foley Mfg. Co	Saw Filing	Plans	Free	143
46	GHQ Motors	Model Engines	Catalog	3 Cents	122
47	A. C. Gilbert Co.	Chemistry Sets	Book	Free	119
48	Gilbert Hall of Science	Toys	Catalog	Free	15
49	Gunmetal Co.	Plating	Details	Free	142
50	Harley-Davidson Motor Co.	Motorcycles	Magazine	Free	121
51	Hemphill Diesel Schools	Instruction	Details	Free	30
52	Hobart Bros.	Welding Equipment	Book	Free	26, 119
53	Ideal Aeroplane & Supply Co.	Model Boats and Planes	Catalog	10 Cents	24

Service Bureau

No. Offer	Firm	Type of Business	Offer Made	Charge	Page
54	Institute of Applied Science	Instruction	Details	Free	30
55	International Correspondence Schools	Instruction	Details	Free	25
56	International Correspondence Schools	Instruction	Booklet	Free	3
57	J & H Metal Products Co.	Tools	Catalog	Free	6
58	Kant-Slam Co.	Hardware	Details	Free	120
59	Kelsey Presses	Printing Presses	Catalog	Free	132
60	LaSalle Extension Univ.	Instruction, Accounting	Book	Free	9
61	LaSalle Extension Univ.	Instruction, Law	Books	Free	20
62	Lejay Mfg. Co.	Electrical Machinery	Plans, Catalog	10 Cents	23
63	Lincoln Airplane and Flying School	Instruction	Details	Free	16
64	Lincoln Engineering School	Instruction, Radio, Elec.	Catalog, Magazine	Free	24
65	The Lionel Corp.	Model Trains	Catalog	10 Cts.	123, 126
66	McSweeney Trade School	Instruction	Book	Free	8
67	Mechanix Universal Aviation Service	Instruction	Details	3 Cent Stamp	32
68	Michigan Trade School	Instruction	Folder	Free	26
69	Midwest Radio Corp.	Radio Equipment	Catalog	Free	22
70	Carl Miller	Patent Attorney	Book and Form	Free	6
71	Albert Mills	General Merchandise	Details	Free	23
72	National Poultry Institute	Instruction	Book	Free	24
73	National Radio Institute	Instruction, Radio	Book	Free	5
74	National Schools	Instruction, Diesel Eng.	Book	Free	18
75	National Schools	Instruction, Radio	Book	Free	26
76	New York Institute of Photography	Instruction	Booklet	Free	142
77	N. W. School of Taxidermy	Instruction	Book	Free	126
78	Northwestern School of Taxidermy	Instruction	Book	Free	142
79	Clarence A. O'Brien & Heyman Berman	Patent Attorneys	Booklet	Free	7
80	Pan America	Musical Instruments	Book	Free	130
81	Plastex Industries	Novelty Mfg. Tools	Book	Free	24
82	Porter Chemical Co.	Chemistry Outfits	Book	Free	19
83	L. F. Randolph	Patent Attorney	Booklet	Free	6
84	Raye Burns School	Instruction, Cartooning	Details	Free	142
85	Reclaimo Mfg. Co	Oil Filters	Booklet	Free	124
86	Re-Nu Tire Groover	Tires	Details	Free	128
87	Rollins Instrument	Drawing Board	Circular	Free	16
88	Harry Ross	Magnets, Microscopes	Catalog	10 Cents	24
89	Shamrock Trailer Parts	Trailer Parts	Catalog	Free	142
90	Silver Mfg Co.	Radio	Catalog	Free	28
91	L. C. Smith & Corona Typewriters	Typewriters	Booklet	Free	131
92	Smooth-On Mfg. Co.	Cement	Book	Free	125
93	C. A. Snow & Co.	Patent Attorneys	Books	Free	27
94	So-Lo Works	Rubber Molds	Book, Buyers List	Free	143
95	South Bend Lathe Works	Tools	Catalog, Booklet	Free	34
96	Speed Way Mfg. Co.	Tools	Circular	Free	132
97	Stamford Co.	Opportunity	Booklet	Free	20
98	Standard Business Training Institute	Instruction	Details	Free	24
99	Tasope's School of Modern Photography	Instruction	Book	Free	130
100	United Factories	Oil Burners	Details	Free	30
101	United Mushroom Co.	Mushroom Growing	Details	Free	26
102	United States Dental Co.	False Teeth	Catalog, Mouth Forms	Free	30
103	Universal Photographers	Instruction	Catalog	Free	30
104	Walker Turner Co., Inc.	Tools	Catalog	Free	119
105	Westwood Correspondence School	Instructions, Airplane Des.	Booklet	Free	24
106	Wholesale Radio Service Co., Inc.	Radio Supplies, Gifts	Catalog	Free	31
107	Wholesale Radio Service Co., Inc.	Radio, Camera Supplies	Catalog	Free	128
108	Wisconsin School of Watch Repairing	Instruction	Details	Free	142

Readers' Service Bureau
MECHANIX ILLUSTRATED,
1501 Broadway, New York, N. Y.

I am interested in the following offers:
(Put numbers in squares) ☐ ☐ ☐

I am enclosing ..... cents in stamps
(Ignore this line if all offers are free.)

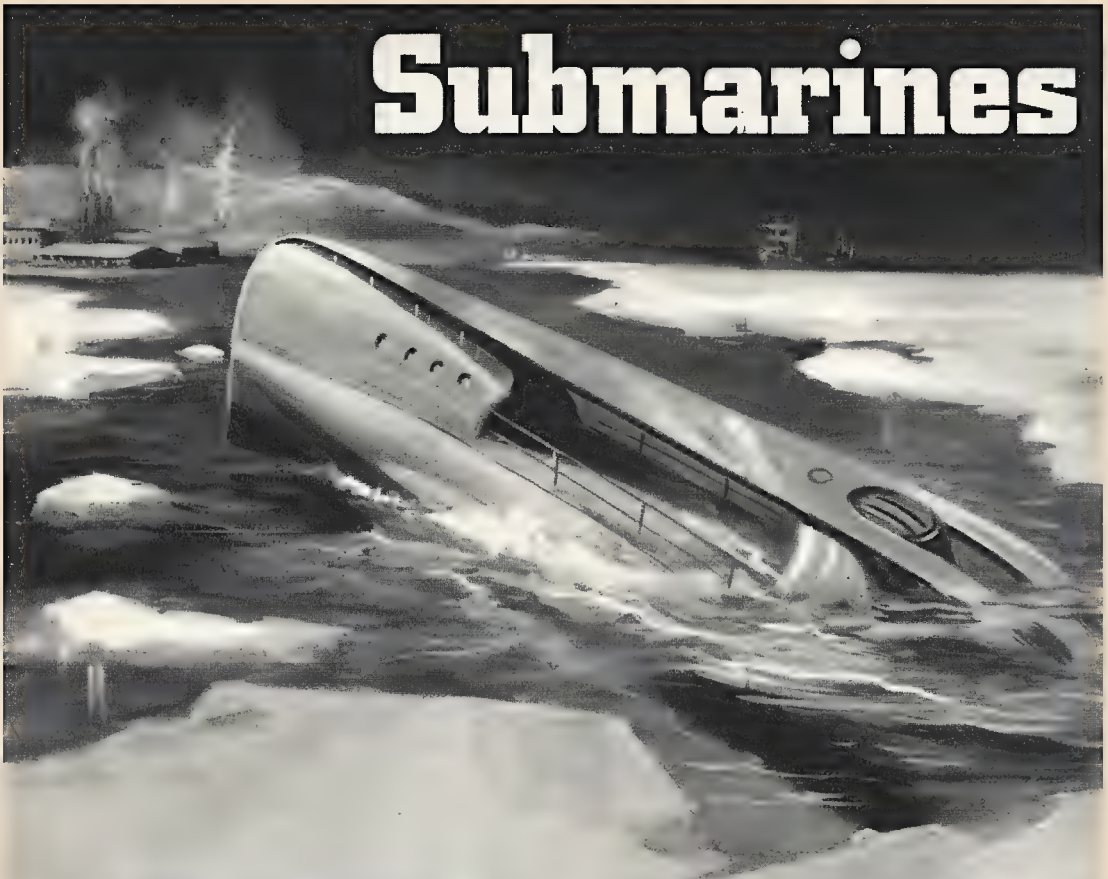
Name

Address

City and State .....

Note: This offer expires January 1, 1939. After this date, write directly to advertisers for offers.

Submarines



I AM confident that one of these days I will be able to walk along the cargo docks and see freight packages plainly labeled: "Ship by submarine."

For freight—and passenger-carrying submarine routes are certain to be established sometime. That certainty of the future is casting its shadow on us just as the coming of the airplane and the electric light and radio communication and all the other great advances of our age were signaled in advance. The Wright brothers and Thomas Edison and Guglielmo Marconi did not realize, perhaps, how great was the world's need for these commonplaces of today. Henry Ford did not think he was making over the United States when he tinkered with a gasoline engine in a rickety shop. But they kept puttering around and were laughed at and suddenly their nonsensical ideas became a part of modern life.

Freight and passenger-carrying submarines will come into use because they are a step ahead of the surface ships of today, just as the first wheezy, stuttering steam-engines furnished a better source of power than blind-folded horses walking around a dusty ring.

Trade routes will be established between European and Oriental and Russian ports, and some of our Northern Pacific ports. The distances now covered by some lines using the Suez and Panama canals will be almost cut in two.

I have previously shown that a submarine is at an advantage as compared with a surface ship because it is relieved of so much dead-weight. In time of storm it need only submerge to a zone of quiet. In good weather it will ride the waves just as the *DEUTSCHLAND* did when Captain Koenig brought her over. Even in the midst of war he only found it necessary to do eighty miles submerged.

Not the least of its advantages is that a submarine can enter ice-bound ports. Vladivostok need never again he closed by the Russian winter. Travel under the ice is more comfortable and safer than bucking winter seas. That has been shown. This is not intended as a bit of sensationalism. It is a simple statement of fact. It is probably true that the reader will recoil at the mere thought of a voyage in the depths of the sea, a lid of ice

[*Continued on page* 123]

in the Future

MI'S "BOOK OF THE MONTH"

The material on these pages is reprinted by special permission of the publishers of "SUBMARINE", The Autobiography of Simon Lake, as told to Herbert Corey.

Every month several meritorious books of special interest to readers of MECHANIX ILLUSTRATED are published. The purpose of this department is to bring outstanding books in the fields of invention, science, mechanics and adventure to the attention of our readers.

Those who wish to read these books in their entirety may order them from local book stores or by mail from the publishers.

"SUBMARINE" is published by the D. Appleton-Century Co., 35 W. 32nd St., New York City. The price is $3.

by SIMON LAKE

(Submarine Inventor)

As told to HERBERT COREY

Because of the inventions of Simon Lake (below) the modern submarine runs on an even keel, is controllable under water, it sees instead of being blind, and it may be operated with a good measure of safety and comfort to the crew. Lake obtained more than 100 patents on submarines. The "Defender" was one of the early submarines with special equipment on the superstructure for observing marine life and conditions while traveling under ice.

Invents New Radio Compass

INVENTED and developed by Warren S. Eaton, well known aeronautical engineer, a new radio compass is said to be unaffected by static which renders other radio directional instruments inoperative. When the new device is tuned to the proper station, the compass needle automatically indicates the direction of the received radio wave, thus guiding the pilot to the airport from which the waves are emanating, facilitating "blind" landings on foggy days.

Tiny Television Set Devised

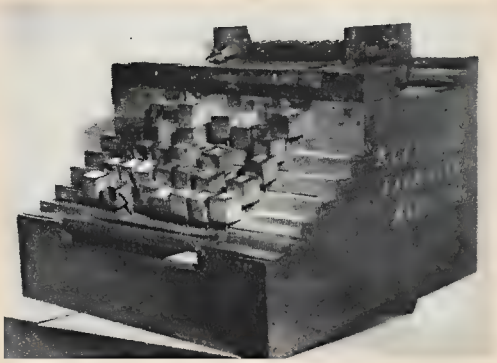
SHAPED somewhat like an ordinary hand telephone, a miniature television receiver which was recently placed on exhibition in London, England, weighs only two pounds. To operate the receiver, it is held so that sound is heard through an earpiece while a television screen is viewed through an opening in the curved end of the instrument, as shown in the photo above. A small dial enables the user to tune the receiver for better reception of broadcasts.

Buys Unique Railroad And Car Equipment For $301

WHAT is probably one of the most unique railroads in the country is now owned by Roy Rawlings, of Hope Valley, R. I. Purchased for $301, the Wood River Branch Railroad, as the railroad is known, consists of a gasoline engine, a caboose, about 5½ miles of trackage and the "Presidential Special" (left).

Collector Buys 200,000 Patent Models

Mr. Gaige is shown holding a fire-proof safe patented by H. Urban on Oct. 30, 1877. Also shown in the photograph are printing presses, addressing machines, a page numbering machine, a meat cutter, combination locks, handcuffs, hand stamps and a device for a rope fire escape. At the right is shown a typewriter patented by Robert T. P. Allen of Farmingdale, Ky., in 1876.



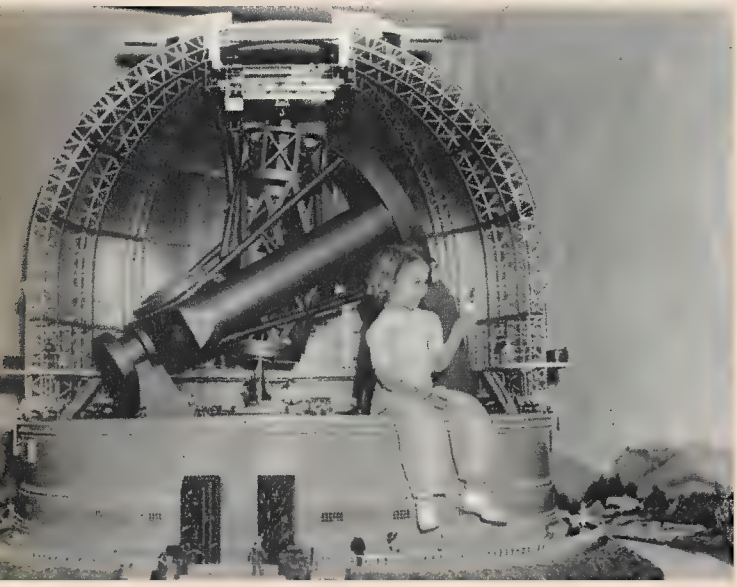
CROSBY GAIGE, theatrical producer, who pursues the hobby of collecting art, antiques, fine books, vintage wines, has added another phase to an already broad one with the purchase of 200,000 patent models submitted to the United States Patent Office from 1820 to 1890. Mr. Gaige describes the collection as "the actual history of American material development for more than half a century."

The collection includes among its almost countless number of models, typewriters, steam engines and boats, office appliances, cannons, machine guns, cash registers, a hog catcher, printing presses, a dentist's chair, a portable burglar alarm, devices to raise sunken vessels, the original egg beater, pianos, a meat cutter, safety crutch, hand cuffs, hand stamps, addressing machine, combination locks, page numbering machines, and a pretzel bending machine.

Besides the models, the collection includes patent applications with drawings of the devices by their inventors. Among these is an application covering the design of a system of air chambers intended to aid vessels in the navigation of shallow waters. Dated 1864, the inventor according to the application, was Abraham Lincoln.

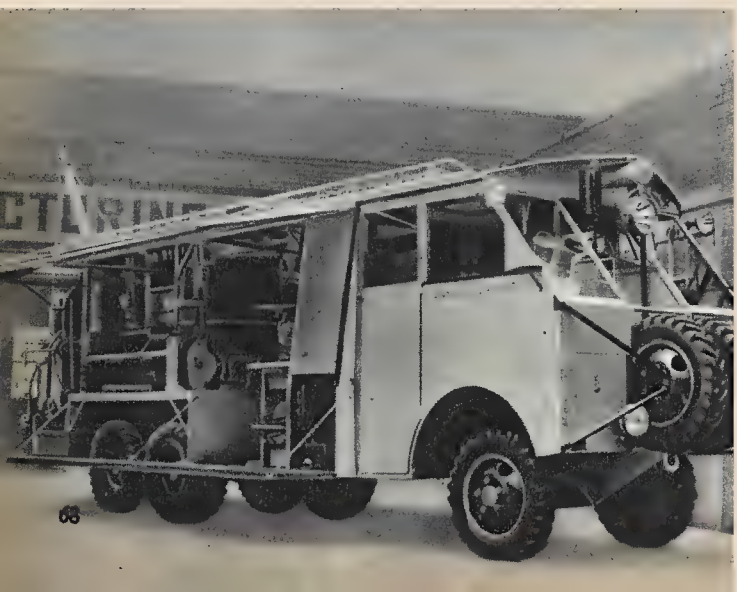
Steel Barrier Keeps Traffic Separated

A STEEL barrier, eighteen inches high and tapering from a tube at the top to a base twenty-six inches wide, is being tested by the Michigan Highway Commission as a device to keep opposite lanes of traffic separated. Even the most reckless drivers will find it difficult to cross over the center of the road when this barrier is set up. Its eighteen-inch height makes it almost impossible to cross.



Model Duplicates Palomar Observatory

JANET CHAPMAN, Warner Brothers starlet, gets right down to the study of astronomy as she visits this replica of the Mt. Palomar Observatory, an exact duplicate of the gigantic observatory on Mt. Palomar. The replica reproduces every movement and function of the original. It is operated by twenty delicately tuned motors, the smallest of which produces one-eighteenth of a horse-power. It will soon go on a world tour to display the superb craftsmanship of the model.



Workshop Designed For Front Line Use

DESIGNED to service pursuit and combat planes based near front lines in time of war, this mobile workshop is equipped to make both major and minor repairs. It will also furnish light and radio for an emergency field. It was designed by Kibbey W. Couse, a mechanical engineer, and is an offspring of a welding cruiser developed by Mr. Crouse to make spot repairs on road-construction machinery.

New Insect Killer Uses Infra-Red Ray

THIS new insect killer which employs the penetrating sections of an infra-red ray, spells death to fleas as well as other insect pests. Harmless to animals and humans, its action on crawling pests is quick and effective. Of spun steel, it is held easily in the hand by means of its non-heat-conducting handle. It operates on either a.c. or d.c. current with equal effect.

Device Determines Line Plunge Force

WITH the aid of this measuring device, it has been found that when a 210-pound lineman charges, the force exerted amounts to 1.5 to 1.7 horsepower. By attaching a padded harness which encircles the neck and shoulders of the player, to the spring, and having him pull instead of push, his pulling power also can be ascertained. The equipment was developed and built by Professor E. C. Clevett of the Purdue University physical training department. This device shows clearly the plunging power of different players.

Oil Can Carries Its Own Illumination

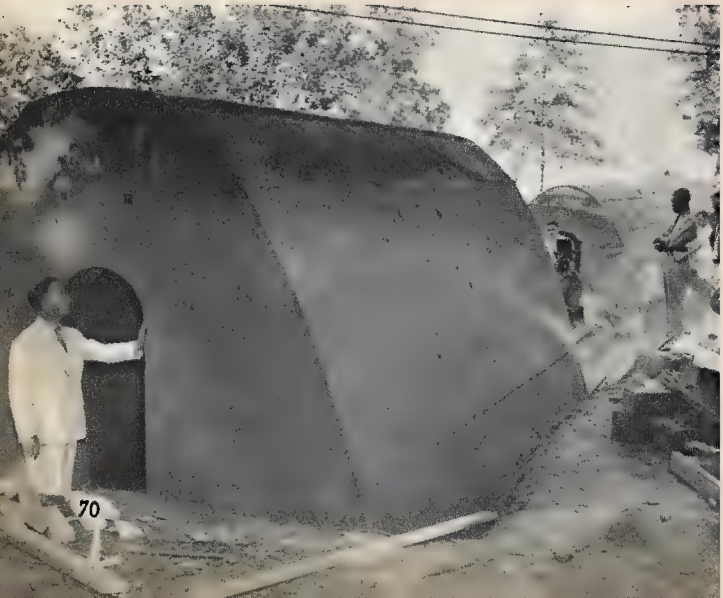
THIS oil can fitted with a small electric light makes it possible for the filling station attendant to have plenty of illumination while checking and filling the car engine with oil. Ordinarily when oil is added at night, it is difficult to see the filling pipe unless a flashlight is available. With this device, the light is always there when oil is being added.

Floating Bridge Is Nearly A Mile Long

THE longest floating bridge in North America, fifteen feet wide and with its driving surface just a few inches above the water, stretches across Chemong Lake near Peterboro, Ont., Canada. Nearly a mile long, the bridge is anchored every hundred feet with chains and large boulders. A stout railing lines each edge from shore to shore. Bays are built out from the edge to enable cars to pass in safety.

Air Cleaner Removes Dirt From Intake

THIS new air cleaner for cars removes grit and dust from the air drawn into the carburetor intake, and expels it immediately. The air is caught at the intake and deflected. Deleterious material is drawn from it and then carried by a special air cleaning liquid, into a "dirt receiver." The air then passes through a condenser and expansion chamber, and enters the engine. It is claimed that this device can save millions of dollars a year in premature wear on any type of air-breathing engine.



New Pill-Box Fort Erected In 4 Hours

THIS is one of the new pill-box forts which was made in four hours. Using the vacuum concrete process, the concrete was hardened in as many hours as it takes days by the ordinary process. The fort was erected as a demonstration to U. S. Army officers that bomb-proof shelters and defense fortifications can be constructed over night in the event of attack by a foreign power.

Betty Goodwin, NBC's first television announcer, is shown before the camera in the new demonstration studio, being televised by Robert W. Clark, television engineer, standing between the televising camera.

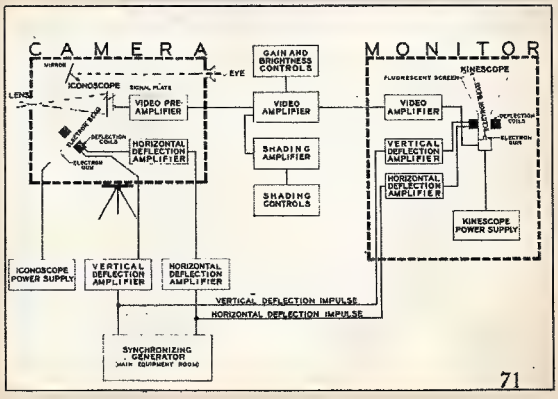
TELEVISION TOUR For Radio City Visitors

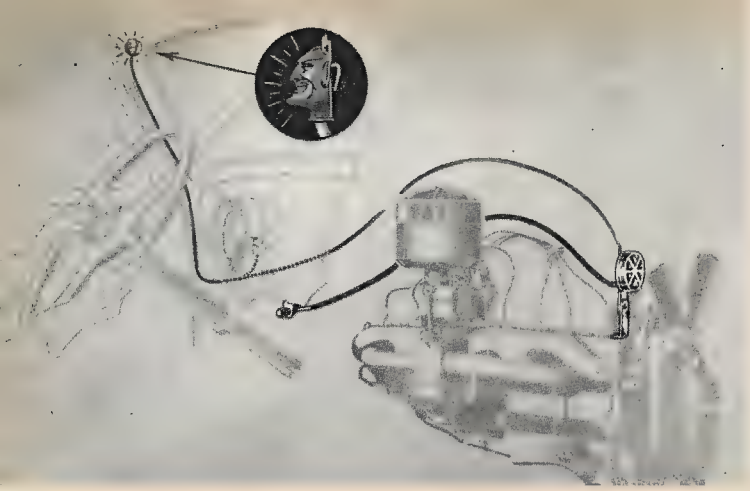
THE newest radio innovation in America—regularly conducted tours for the public of "behind-the-scenes" in television—is demonstrated by the National Broadcasting Company at Radio City.

The tours give visitors an opportunity not only to view real telecasts, but to participate in television demonstrations themselves during their visit to the studio. Each group appears before the camera for the party following, which sees the first group on receivers in an adjoining room.

The exhibit includes a complete television studio. This is a self-contained unit, entirely separate from the one now in use for the current experimental telecasts by NBC-RCA over Station W2XBS atop the Empire State Towers. An explanation of the fundamentals of television also is provided.

Above—The equipment in this receiver-monitor is enclosed in glass for the benefit of visitors on the television tour. Below—A simplified diagram of the television demonstration equipment.



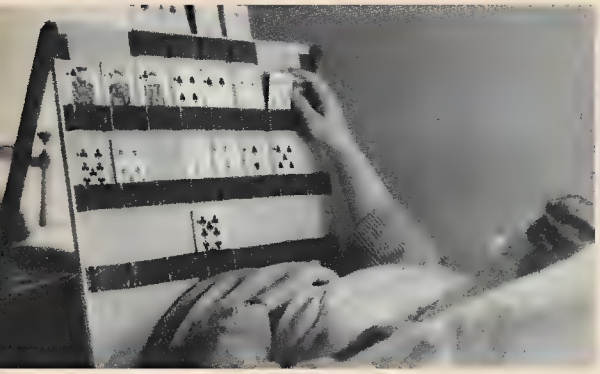


Devil-Face Auto Lamp Warns Of Speeding

HOOKED above the windshield of an auto, a novel devil-face lamp (inset) illuminates when the car exceeds a safe speed, warning the driver. The device is actuated by the air blast of the engine fan, which causes an electrical contact to be made.

"Mosquito" Plane Has Tiny 30 H.P. Motor

DEVELOPED to encourage greater interest in sport flying, a new French lightplane is powered by a tiny motor of only 30 horsepower. Aptly named the "Mosquito," the aircraft weighs only 720 pounds fully loaded with fuel and pilot, travels at a speed of 78 m.p.h. and has a cruising range of 200 miles. The wingspan is 26¾ feet, length 19 feet and height, from ground to top of wing struts, only 6½ feet.

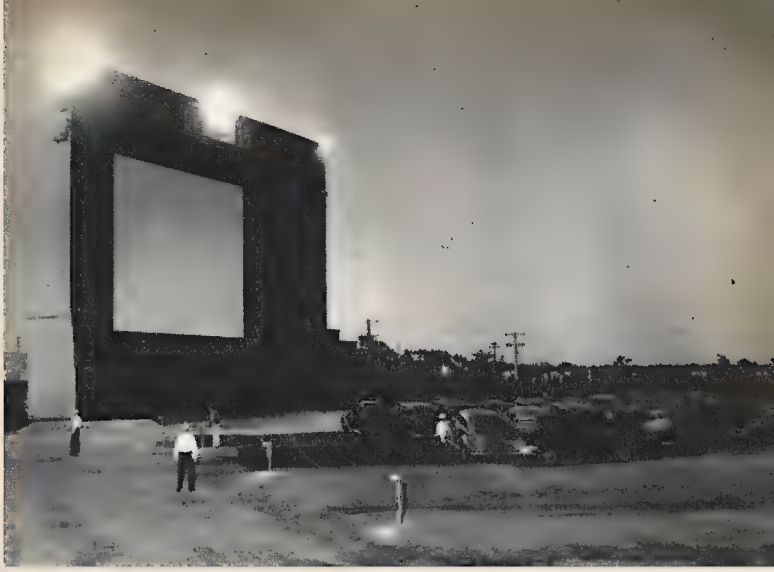


Gameboard Cheers Invalids

DESIGNED for use by patients confined to bed, a new gameboard is fitted with metal pockets for holding cards (left), making it possible for the patient to play solitaire while fully reclined. The reverse side of the board features a peg-type checker board (lower left), the pegs of which can be plugged into the bottom row to support a magazine, as shown below.

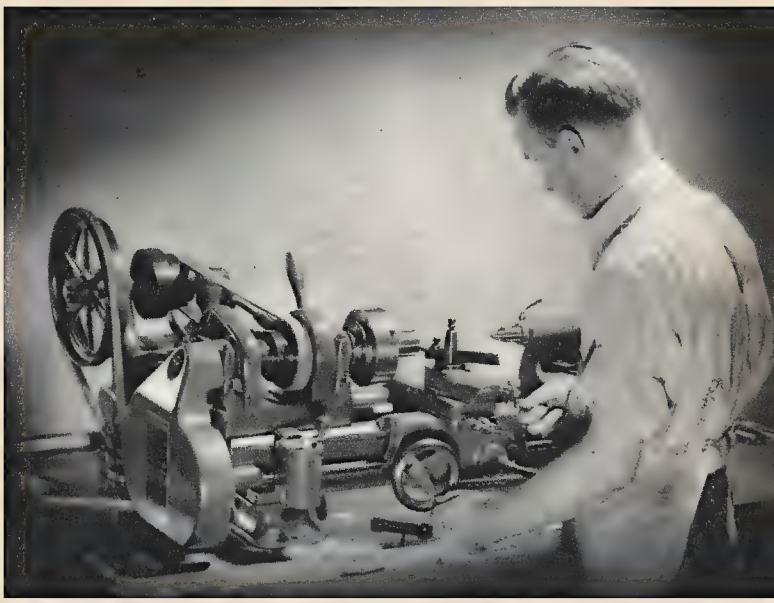
Drive-In Theater Has Room For 500 Cars

CONSTRUCTED on the site of a former airport at Valley Stream, N. Y., a new open air drive-in motion picture theater accommodates 500 automobiles at a single performance. The semi-circular ramps on which the cars gather before the screen are arranged so that the front of each car is elevated and the rear depressed.



Metal-Working Lathe Boasts New Features

EQUIPPED with a one-third horsepower motor and adjustable horizontal countershaft, with two-step pulleys to provide speeds ranging from 40 to 1,200 r.p.m., a newly developed back-geared metal-working lathe is specially designed to handle the machining of very small diameter parts of steel, cast iron, brass, etc. The lathe is equipped with many new features providing greatest accuracy and precision and takes 38 attachments for a variety of jobs including grinding, milling, etc.



Starts 7,000-Mile Trip In 1907 Automobile

TRAVELING in a two-seater automobile which he bought second-hand in 1907, George C. Green, and his wife, of Lambertville, N. J., have started a vacation tour of the United States during which they hope to cover more than 7,000 miles. The venerable car has a top speed of 30 m.p.h. and the wheels are fitted with motorcycle tires.

Welded-On Alloy Strips Improve Iceboat's Runners

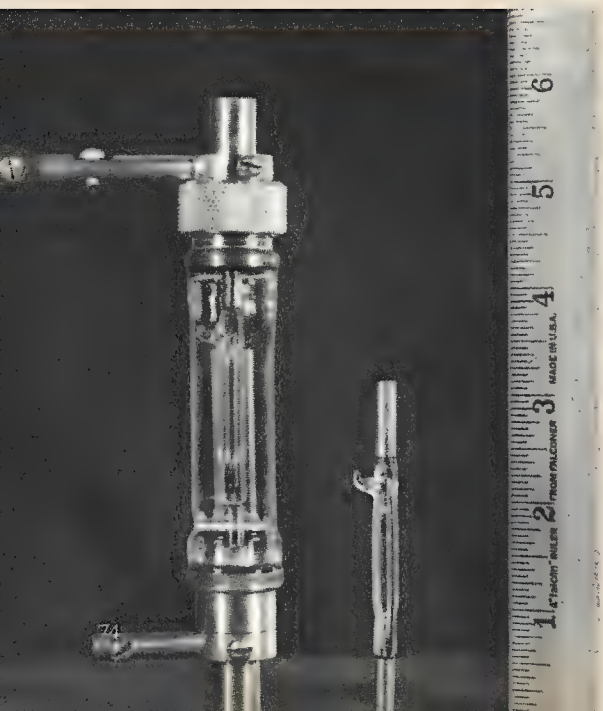
APPLIED to the runner edges of an iceboat by welding (above), a strip of wear-resistant alloy of cobalt, chromium and tungsten is said to make the edges keener and long-lasting. After cooling from the welding operation, the alloy-tipped runners are ground sharp in the same manner as plain steel runners and are then ready for use (above), sliding easily over the ice due to a low coefficient of friction.

New Lamp Is "Midget Sun"

DEVELOPED specially for use in photo-engraving work, searchlights and for therapeutic application, a new 1,000-watt mercury lamp is only slightly larger than a cigarette. An ingenious water-cooling jacket into which the lamp is inserted permits three quarts of water per minute to flow past the lamp, dissipating the tremendous heat generated when lit. The photo shows the lamp and its water-cooling jacket.

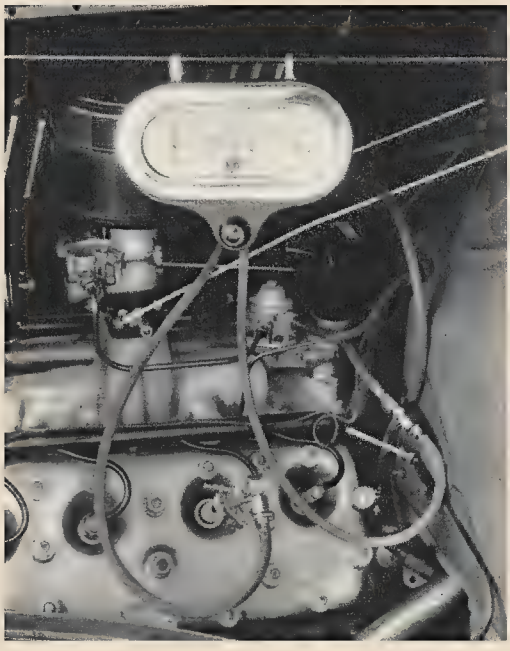
Novel Clock Boasts 93 Dials

CONSTRUCTED at the suggestion of the late King Albert of Belgium by his clockmaker, Lodewyk Zimmer, a clock with 93 dials was recently placed on exhibition in New York, N. Y. The clock shows the relation of the planets to the earth and sun at any time and the earth's position in its orbit around the sun. The clock also provides sidereal time, meridian time and an imaginary time based on a day of only ten hours.



Builds Home And Furniture From Old Newspapers

BECAUSE he disliked throwing away old newspapers, Elis Stenman, of Pigeon Cove, Mass., developed a process whereby he could fold them tightly and fashion them into panels from which he constructed a home and a complete suite of furniture, as shown in the photographs above. More than 100,000 newspapers were used to complete the project and the walls are composed of panels, each of which is 215 sheets thick.



Gauge Shows Engine Faults

PROVIDING a simultaneous triple check of an automobile motor, a new garage device features three gauges which register oil pressure, individual cylinder compression and the vacuum and pressure on the fuel pump intake and output sides, respectively. The device can also be used to check valve troubles, spark advance and other ignition deficiencies.

Instrument Tests Motor Oil

FEATURING a calibrated dial indicating "good," "bad," or "?" a new instrument employs an electric eye to determine quickly the condition of crankcase oil. A sample of the oil is placed on a glass slide which is then inserted in the instrument. The amount of light that passes through the oil to reach the electric eye determines the dial's reading.

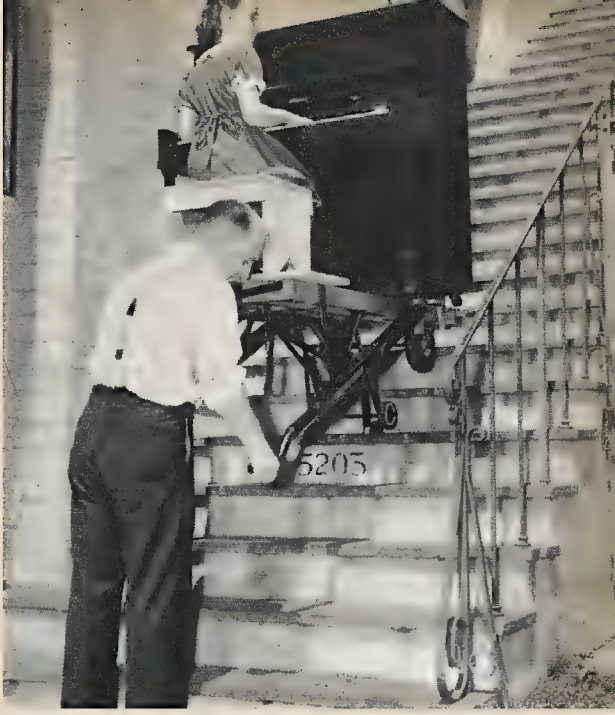
The DC-4's radio receiving and transmitting equipment is mounted in panel form behind the pilot, as shown above and at upper right, but are remotely controlled in flight by a master control column rising between the pilot and co-pilot. Below—A direction-finding loop is mounted in plane's nose.

DC-4 Airliner Has Powerful Radio

THE recently developed 42-passenger Douglas DC-4 airliner is equipped with the most powerful and comprehensive radio equipment yet produced for commercial air transport service, making it possible, for the first time, for a flight crew to make simultaneous observations of beacon, weather and marker signals while holding two-way communication with the landing field. During flight, the pilot may talk over any one of ten different frequency bands and a special direction-finding loop enables him to instantly check the plane's position with respect to ground stations. The radio panel is installed behind the co-pilot's seat.

Makes 14-Mile Underwater Trip In Home-Built "Sub"

A NOVEL one-man fish-shaped submarine, in which he has made 347 dives, has been constructed by Barney Connett, of Chicago, Ill. The underwater craft is powered by two sets of batteries and has the usual submarine equipment including blowers, oxygen supply, air pumps and a respirator. Traveling three feet under the surface of Lake Michigan, navigating by means of a four-foot periscope, Connett recently made a 14-mile trip in his submarine.



Truck Enables One Man To Move Piano Up, Down Stairs

ENABLING one man to move a piano up or down a stairway, a hand truck developed by Herbert Mueller, of Hollywood, Calif., balances first on its front wheels and then on the back wheels, which are so constructed that they automatically proceed to the step above (or below, if descending) when the piano's weight is supported by the front wheels. As shown in photo, the piano remains level throughout the ascent or descent of the stairway.

Cotton Picker Device Mounted On Tractor

MOUNTED on a specially designed tractor, a new cotton picker developed by John and Mack Rust, of Memphis, Tenn., picks each row of planted cotton twice in a single operation. A smaller cotton picker, which can be hitched to general utility tractors, was built by the brothers last year.

A list of manufacturers of items mentioned in MECHANIX ILLUSTRATED will be sent to readers upon request.

"MEN WITH WINGS"

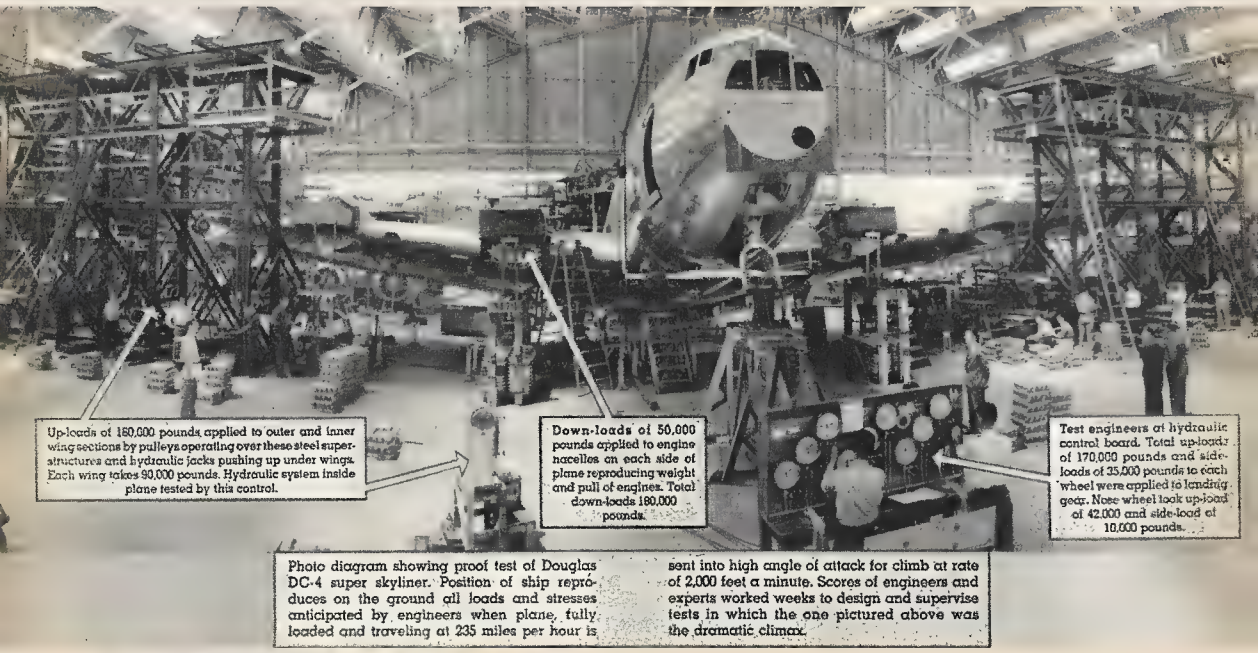

Up-loads of 180,000 pounds applied to outer and inner wing sections by pulleys operating over these steel superstructures and hydraulic jacks pushing up under wings. Each wing takes 90,000 pounds. Hydraulic system inside plane tested by this control.
Down-loads of 50,000 pounds applied to engine nacelles on each side of plane reproducing weight and pull of engines. Total down-loads 180,000 pounds.
Test engineers at hydraulic control board. Total up-loads of 170,000 pounds and side-loads of 35,000 pounds to each wheel were applied to landing gear. Nose wheel took up-load of 42,000 and side-load of 10,000 pounds.

Photo diagram showing proof test of Douglas DC-4 super skyliner. Position of ship reproduces on the ground all loads and stresses anticipated by engineers when plane, fully loaded and traveling at 235 miles per hour is sent into high angle of attack for climb at rate of 2,000 feet a minute. Scores of engineers and experts worked weeks to design and supervise tests in which the one pictured above was the dramatic climax.

The winner of first prize in the "Men With Wings" Contest will not only get a free round-trip flight to Hollywood to meet movie celebrities like Fred MacMurray, Louise Campbell and Ray Milland (above), who star in the picture for which the contest is named, but will also visit the Douglas Aircraft Company plant to see giant airliners being constructed, as shown in top photograph.

BY ANSWERING ten simple aviation questions and writing a 25-50-word letter on the subject—"Who Is Aviation's Greatest Hero?"—you may be the one to win a round-trip airline flight to Hollywood, Calif., or one of the other 22 excellent prizes which will be awarded in the "Men With Wings" Contest being sponsored by Paramount Pictures and MECHANIX ILLUSTRATED. As an added treat to that of meeting famous motion picture stars at Paramount's Hollywood Studios, the winner of the airline trip

Below—A kit of materials for constructing a "Miss America" gas-powered model (less engine) is fifth prize in the contest.

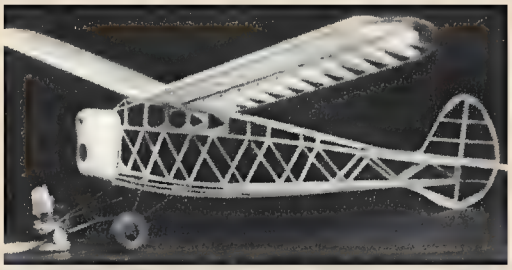
CONTEST
Features Many Prizes

will also be taken on a tour of the Douglas Aircraft Company plant in Santa Monica, Calif., where he (or she) will be able to see some of the world's largest transport and military airplanes being constructed.

A complete listing of prizes and contest rules begins on page 80 of this issue, while the ten simple aviation questions are to be found in a box on this page. Read the rules carefully and then enter the contest, for you certainly don't want to pass up this opportunity of winning one of the numerous prizes that are being offered.

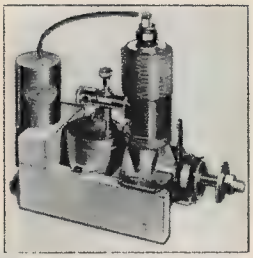
The contest questions are based on aviation facts and you can look up the answers in standard reference books, but it won't be half as much fun as seeing Paramount Picture's new all-Technicolor production—"Men With Wings"—at your local theater and learning the answers from its colorful and thrilling scenes.

Popular Fred MacMurray, Ray Milland and Louise Campbell are the stars of the thrilling motion picture, which records the feats of such famous flyers as Bleriot, first man to fly the English Channel; Alcock and Brown, first men to fly across the Atlantic; Lindbergh, first man to fly solo across the Atlantic; Wiley



Here is a case where the number "13" is not unlucky, for the winner of thirteenth prize in the contest will get a kit for constructing a "Bay Ridge Mike" gas-powered model (less engine), which is shown covered and uncovered in photos above. Wingspan 48 inches.

To the winner of ninth prize in the contest will go a kit of parts for building the popular "Quaker Flash" gas-powered model plane (less engine) shown below. Right—This powerful Brown, Jr., miniature gasoline motor, completely assembled, will go to winner of seventh prize in the MI-Paramount "Men With Wings" national contest.



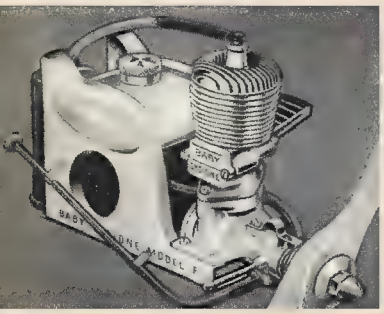
CHECK ONE SQUARE FOR EACH QUESTION.

1. The first successful airplane flight was made by the Wrights on December 17, 1903 ☐ December 17, 1907 ☐
2. The United States Army had no airplanes before the World War Yes ☐ No ☐
3. When Alcock and Brown made the first successful flight across the Atlantic Ocean they landed in Long Island ☐ Newfoundland ☐
4. Colonel Charles Lindbergh started his famous trans-Atlantic flight from Orchard Beach, Maine ☐ Curtiss Field, L. I. ☐
5. The name of Colonel Lindbergh's monoplane was Winnie Mae ☐ Spirit of St. Louis ☐ Old Glory ☐
6. The early pioneers were more interested in the development of the airplane as a means of transportation than in its possible value as a weapon of war Yes ☐ No ☐
7. The first scheduled air mail planes were flown by U. S. Army pilots Yes☐ No ☐
8. Commercial pilots must first serve as test pilots Yes ☐ No ☐
9. Corrigan flew to Ireland with the aid of a "gyro-pilot" and other modern direction-finding instruments Yes ☐ No ☐
10. Wing flaps were invented to make an airplane fly faster Yes ☐ No ☐

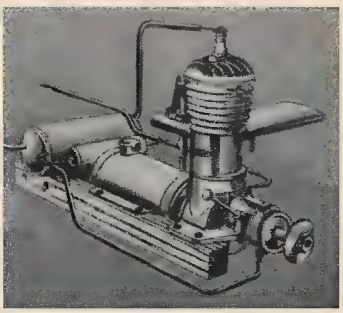
Name and Address .....

..... Age .....

After checking off your answers to the above questions, tear out this coupon (or make a copy of it) and send it, together with your 25 to 50 word letter on the subject—"Who Is Aviation's Greatest Hero?"—to Contest Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

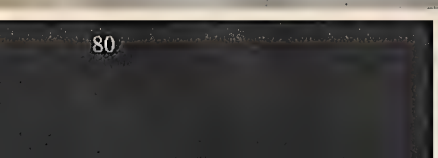


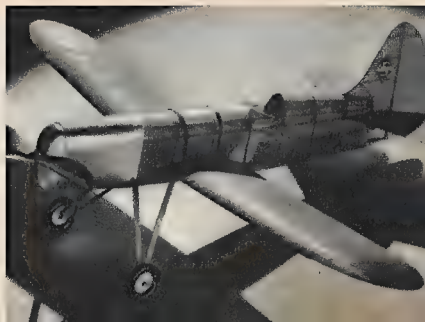
Above—Only a screwdriver is needed to assemble a miniature gasoline engine for model planes from this GHQ motor kit, two of which will be awarded as 11th and 12th prizes in the "Men With Wings" Contest. Left—The "Baby Cyclone" motor which will be awarded, fully assembled, as second prize. Left, below—This Atwood "Phantom" motor, ready to run, will be fourth prize.



Right, above—A "Gwin Aero" midget engine is sixth prize.

A kit for building a rubber-powered Guillow Endurance Model (left) will be awarded as 17th prize. The winner of third prize will receive a kit for building a six-foot Comet "Clipper" gas model (less engine), as shown below. A copy of "Your Wings", published by Funk & Wagnalls Company, will be awarded to winners of 18th to 23rd prize, respectively (below).





Post, first man to fly solo around the globe, thus helping you to choose a subject for your short letter on "Who Is Aviation's Greatest Hero?" as required in the rules listed on page 138. Of course, you may feel that some famous aircraft designer or test pilot is aviation's greatest hero, or that Rickenbacker, Luke, or some other World War ace deserves that rating. Write about any man you believe to be worthy of the title "Aviation's Greatest Hero," but be sure to explain why you selected him. Contestant's letters will be judged on reasons given for the selection made, and for sincere expression. Fancy language will not count. Write your entry with pen and ink or use a typewriter.

PRIZES

First prize in the big "Men With Wings" contest will be the free round-trip airline trip to Hollywood, California, as well as the added treat of visiting the Paramount Studios, to meet famous movie stars and visiting the Douglas Airplane Company plant in Santa Monica.

Second prize will be a famous World's Champion Baby Cyclone miniature gasoline engine for model planes and boats donated by Aircraft Industries of Glendale, Calif.

Third prize consists of a complete kit of parts for assembling a six-foot Comet Clipper gas-powered model airplane (less engine) donated by the Comet Model Airplane Company of Chicago, Ill.

Fourth prize will be an Atwood "Phantom" miniature gasoline motor donated by Phantom Motors of Los Angeles, Calif.

Fifth prize is a complete kit of parts for constructing a "Miss America" gas model plane (less engine), donated by the Scientific Model Airplane Company, of Newark, N. J.

Sixth prize consists of a Gwin Aero miniature gasoline engine donated by the Bunch Model Airplane Co., of Los Angeles, Calif.

Seventh prize is a Brown, Jr., Model B miniature gasoline motor donated by Junior Motors Corporation, of Philadelphia, Pa.

[*Continued on page* 122]

The sleek "Silver Streak" model shown below can be built from the kit which will be awarded to the winner of 15th prize.

New Army Rifle Shoots Five Times Faster Than Old Type

FEATURING a firing speed which is five times faster than that of rifles now in use, a newly developed .30 caliber U. S. Army rifle holds eight cartridges that can be fired by merely pulling the trigger, gas from the explosion immediately ejecting the empty cartridge and throwing another into firing position, thus eliminating the hand-operated bolt used on present rifles.

Model Midget Racing Auto Attains Speed Of 45 M.P.H.

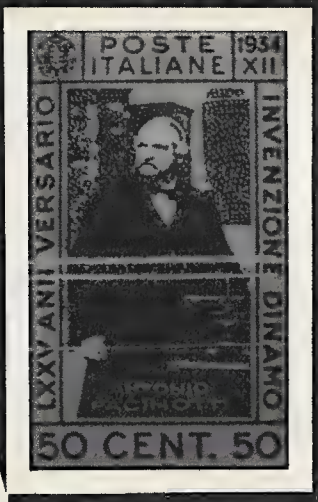
POWERED by a one-cylinder motor of one-fifth horsepower, a model midget racing car constructed by Ralph Pickard, of Hawthorne, Calif., is said to attain a speed of 45 m.p.h. The model weighs seven pounds, has a 14-inch wheelbase and can run about two miles on the two ounces of gasoline carried in its tiny fuel tank. The body is made of pressed steel and the axles are tubular steel.

World's Largest Gold Dredge In Operation

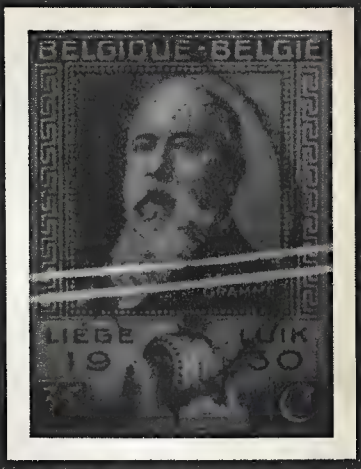
CONSTRUCTED at a cost of about one million dollars and claimed to be the world's largest, a gold dredge recently placed in operation near Hammonton, Calif., handles 18,000 cubic yards of gravel daily. The mammoth dredge can dig successfully at underwater depths of 112 feet, its numerous buckets each scooping up 17 cubic feet of gravel at a time. A 1,200 horsepower electric motor powers the dredge's huge mechanism.

WHO INVENTED IT?

Two Austrian semi-postage stamps shown above picture inventors Kaplan, below, steam-turbine inventor, and above, Ressel, claimed by Austrian authorities as the inventor of the propeller.



Italy portrays Antonio Pacinotti on a postage stamp and claims that he invented the dynamo.



Zenobe Gramme, portrayed on a stamp of Belgium, is claimed by that country as the inventor of the dynamo!

Right—This statue in Washington, D. C., to John Ericson, in honor of his invention of the screw propeller.

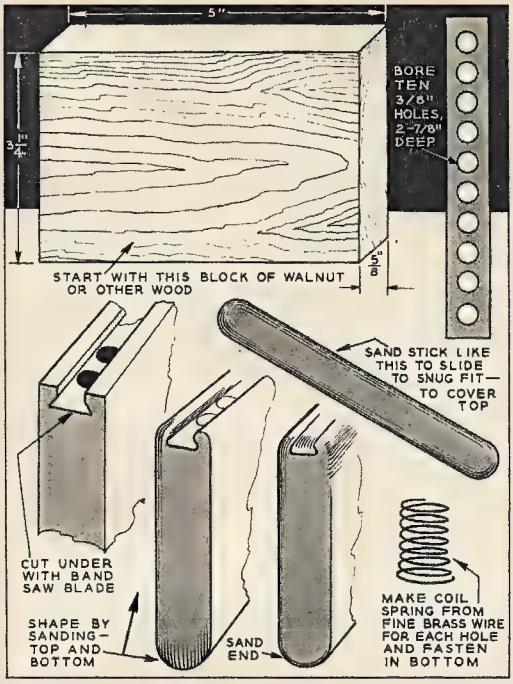
THE SERPENT'S TRAIL

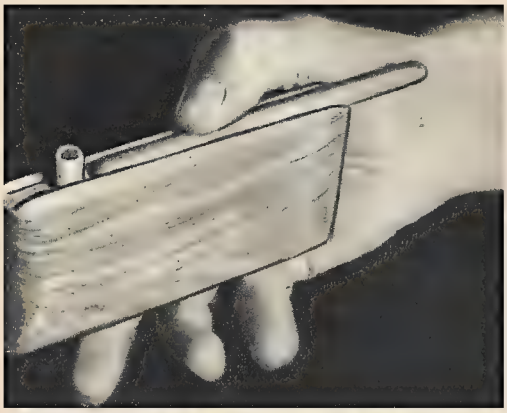
SINCE time began for man, the serpent, or snake, has been accepted by him as a symbol of greatness and might. In the Garden of Eden the snake meant evil try; but in other parts of the world the snake was often looked upon as a good omen. Ancient carvings, old coins, all reveal various uses of various types of snakes; and the serpent was often worshipped in many sections of the world. Because the snake sheds his skin, some people have taken him as the symbol of rejuvenation and everlasting life! To the very ancient Egyptians the snake, or serpent, was fully established in their religion as the sign of fertility.

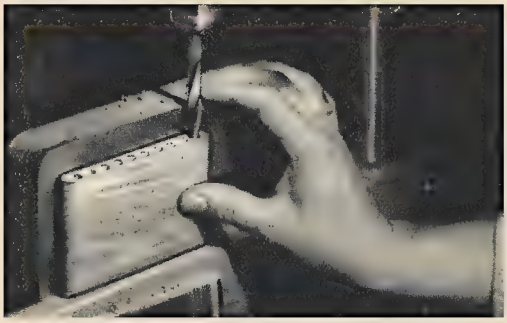
Various positions of a snake were shown in their drawings and each position was supposed to be itself symbolic.

CRAFTS AND HOBBIES

SOLID WOOD CIGARETTE CASE


5"
3 1/4"
BORE TEN 3/8" HOLES, 2-7/8" DEEP
START WITH THIS BLOCK OF WALNUT OR OTHER WOOD
SAND STICK LIKE THIS TO SLIDE TO SNUG FIT— TO COVER TOP
CUT UNDER WITH BAND SAW BLADE
SHAPE BY SANDING— TOP AND BOTTOM
SAND END
MAKE COIL SPRING FROM FINE BRASS WIRE FOR EACH HOLE AND FASTEN IN BOTTOM





The cigarette case completed and ready for use is shown in the top photograph. Above is shown the case being drilled. Use a drill size only slightly larger than the cigarette diameter.

THIS distinctive, solid wood cigarette case is not much thicker than a leather case, and has a single sliding wood strip which locks the cigarettes in the holes. When you pull this strip slowly along, small brass springs cause the cigarettes to pop up about ½ inch.

Any wood can be used but burl or crotch grain will add to the case's beauty. Cut the block, and then bore the 10 holes evenly spaced as shown. With a sanding disc and No. 0 sandpaper, shape the ends, bottom and top. To flute the top so the slide will lock in place, stand the case on end and carefully undercut with a knife blade. A little additional sanding will be necessary. When fitted, push the slide in place and sand the top to shape.

The coil springs are made by wrapping fine spring brass wire about a nail held in the lathe chuck while you turn it by hand. This spring should be loose in the hole and about ¾ of an inch long when relaxed. Fasten the springs in the holes either by making the last turn or two quite small so that each can be held with a tack driven into the bottom of the hole, or by bending the last turn or two large enough to pinch the sides of the hole and thus anchor them once they are placed.

NEW USES for

by Fred A. Beard

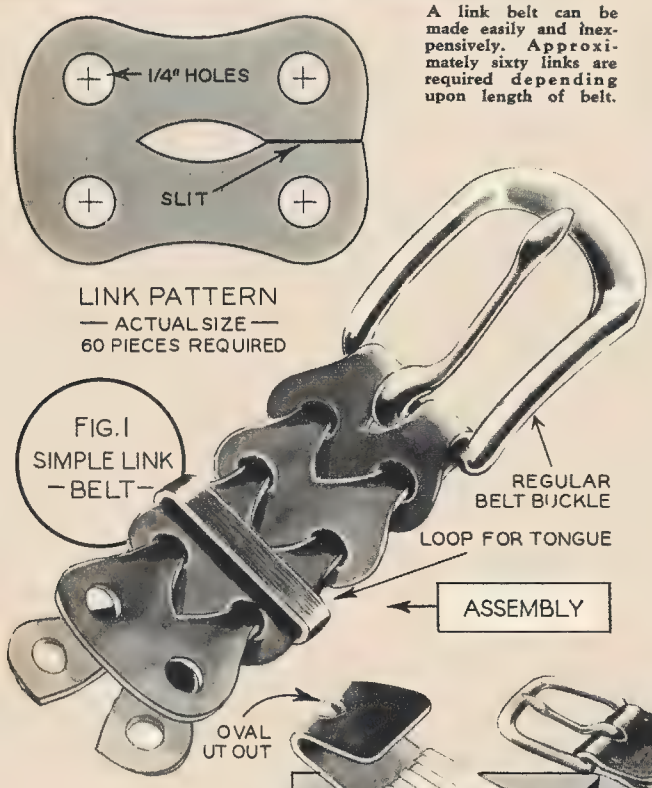
WHY not make a belt from that old pair of shoes you are about ready to discard? I know, I know, don't tell me—you don't see a long enough piece of leather in a pair of shoes to make a belt. That proves you have never read the ancient story about the queen whose share of the spoils of battle was a piece of land the size of an ox hide. By cutting the hide into one continuous thong, she encircled enough land to build a great city!

There is a vast amount of room to exercise your ingenuity in a pair of old leather shoes. Just offhand, if your supply of shoes holds out long enough, you can make several styles of belts, key-case, hatband, wristband, lanyard, coin purse, watch fob and other items.

And as for equipment, if you have an awl, a leather punch, a pair of scissors and a spike, you are armed to the teeth!

The link belt, for instance, is just as easy to make as it looks, to say nothing of being most handsome and comfortable. Cut out about sixty links, as in Fig. 1, punch four ¼-inch holes in each link, and put them together in succession as shown. Start with the buckle, and insert the loop at about the second or third link. The other end is finished with a plain piece, doubled, sewed and cut with two tabs on which are placed snaps. This belt will always fit because links can be added or removed.

A link belt can be made easily and inexpensively. Approximately sixty links are required depending upon length of belt.



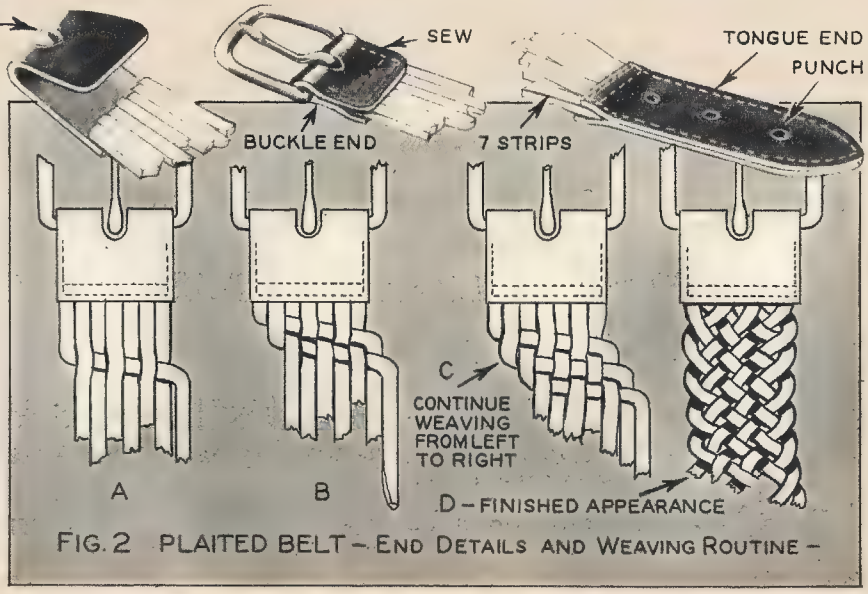


FIG. 2 PLAITED BELT – END DETAILS AND WEAVING ROUTINE –

Above is shown a sample link. Inasmuch as it is shown full size, it can be used as a pattern for tracing the outline on leather.

Right — When the weaving is completed for the plaited belt, it should be pulled from each end to straighten out the weave correctly.

OLD SHOES

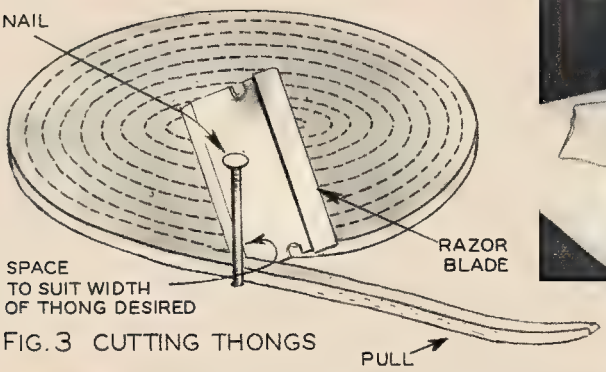


FIG. 3 CUTTING THONGS

Above is shown the method of cutting a long thong from a round piece of leather. At the left is shown the method in greater detail. The width of the strip will be regulated by the distance of nail from blade.

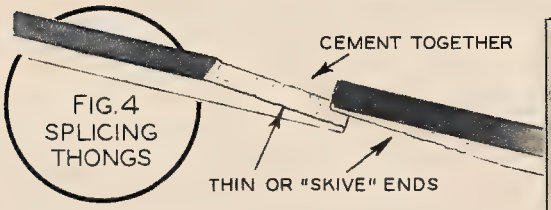


FIG. 4 SPLICING THONGS

When making any plaited work, first cut the leather into long, thin strips or thongs. Always cut the shoe leather into as large discs as possible. Force a razor blade into a board, and place a brad beside it at a distance equal to the desired thong width. After starting the thong with scissors, insert the end of it between the razor blade and the brad, as shown in Fig. 3, and pull gently until the disc is cut spirally to the center. With a little practice, you can "unwind" a leather disc as easily as if it were string.

Short lengths of leather thong may be spliced together by thinning (called *skiving*) the ends and cementing them together, as in Fig. 4.

To make the plaited belt, insert the buckle into the punched piece indicated in Fig. 2, fold back, insert the thong ends close together, and sew across it to hold the buckle and thongs in place. Begin to weave with the strand on the left-hand side, as in 2-A, and follow it, weaving alternately, with the very next strand, which has now become the left-hand strand. After a strand has been woven across, allow it to drop down on the right side to become the right-hand strand. Continue weaving, always from left to right, until the desired length is reached. Finish with a plain end, sewed across the thongs as at the buckle end. By pulling on the ends, the belt can be straightened out. It will be found to have

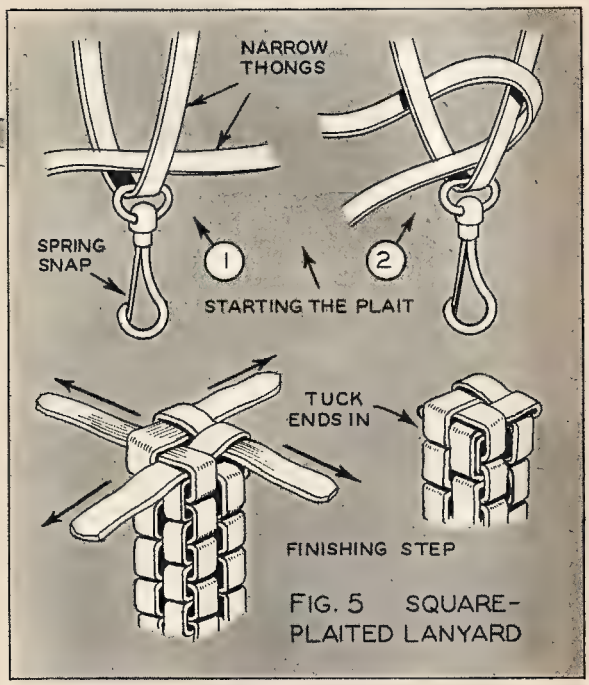


FIG. 5 SQUARE-PLAITED LANYARD

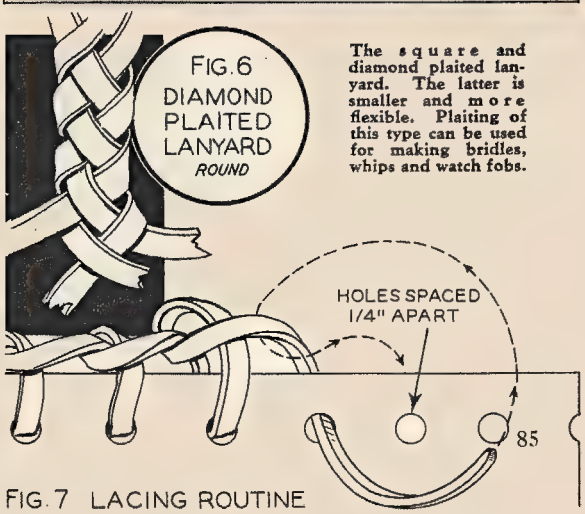
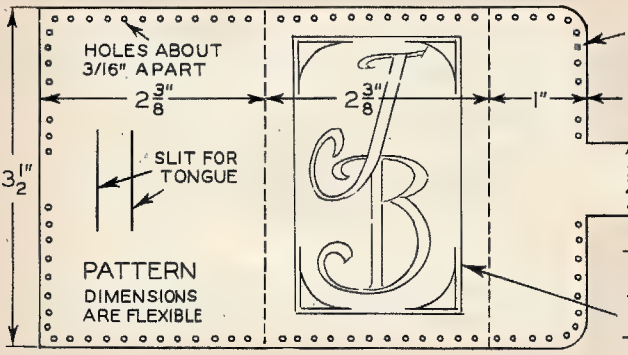


FIG. 6 DIAMOND PLAITED LANYARD *ROUND*

The square and diamond plaited lanyard. The latter is smaller and more flexible. Plaiting of this type can be used for making bridles, whips and watch fobs.

FIG. 7 LACING ROUTINE

Cutting old shoes into thongs, links and discs. This pastime can be interesting as well as productive of useful articles.



considerable stretch, and allowance should be made for that before sewing on the tongue end.

Tooled leather articles are easy to make from old shoes. A No. 20 spike flattened on one end to a spoon shape, across which is made a diagonal cut with a hack-saw and polished, makes a good tool (Fig. 9). The other end of the spike should be ground down to a smoothly rounded point. Dip the leather a few times in water, wipe dry, and trace the desired design on it, using the blunt point on the tool, Then, with the spoon-shaped end, work the leather down over all areas *except* the design you have traced. As you work, the background will recede and the design will begin to raise, giving a relief effect to the work. If the leather dries before you are through tooling, wet the hand and pat the water into the face of the leather. When the leather dries, the design will be permanent, and years of carrying it in your pocket will not remove it.

Before lacing the edges of an article, be sure that any lining desired is cemented into place. With an awl, punch holes about ¼-inch apart and close to the edge. Bind the edge with as

[*Continued on page* 118]

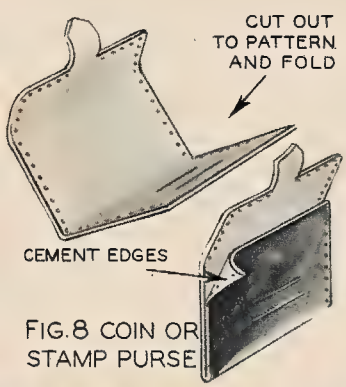
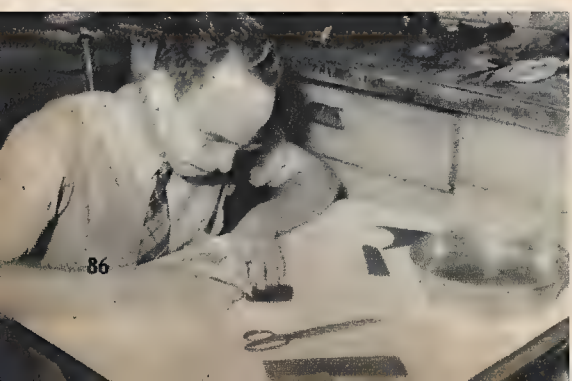


FIG. 8 COIN OR STAMP PURSE

The method of laying out and making a coin or stamp purse. Before lacing the edges, the lining should be cemented in place.



A spike flattened on one end makes a suitable tool for working leather. The flat end should be spoon-shaped and the other end brought to a round point.

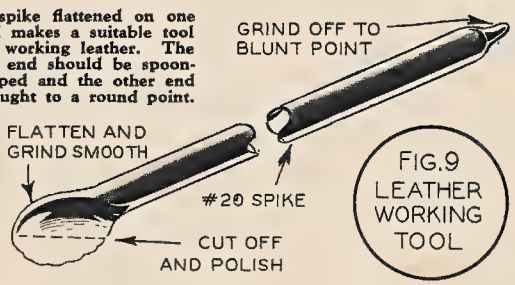
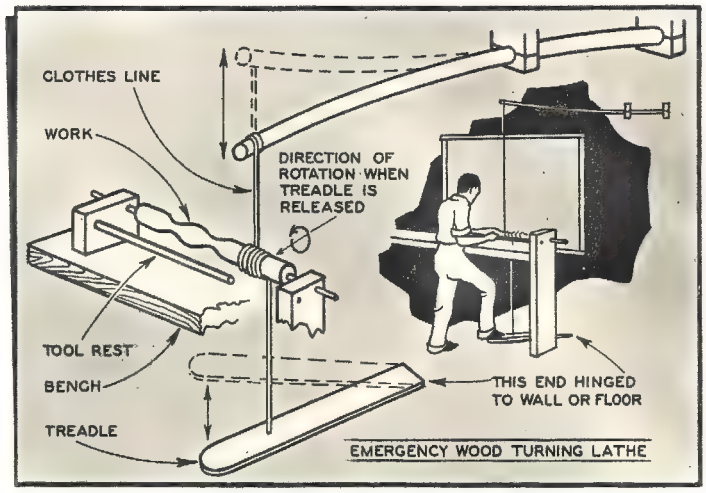


FIG. 9 LEATHER WORKING TOOL

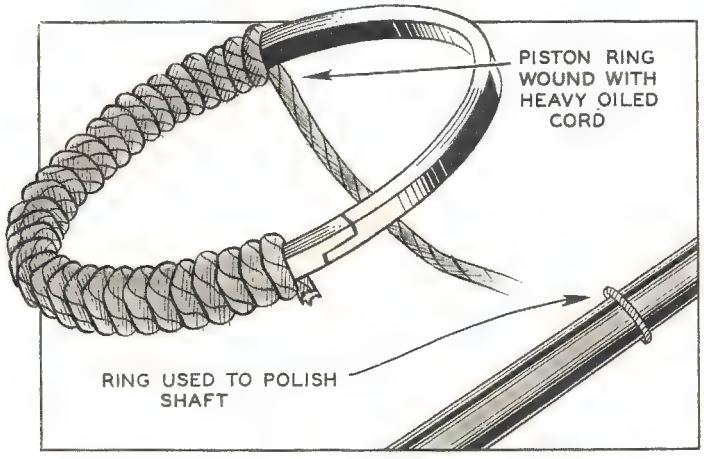
Easily Constructed Lathe Does Simple Turning Jobs

WHEN a simple turning job is necessary and no lathe is available, the arrangement shown at the right will furnish a satisfactory substitute. A pole approximately eight feet long and 1¾ inches in diameter is fastened to the ceiling at two points, as shown. A piece of clothesline is connected from the free end to a foot treadle. Two or three turns of the rope around the work will be sufficient to give the necessary traction. A piece of iron pipe serves as a tool rest.



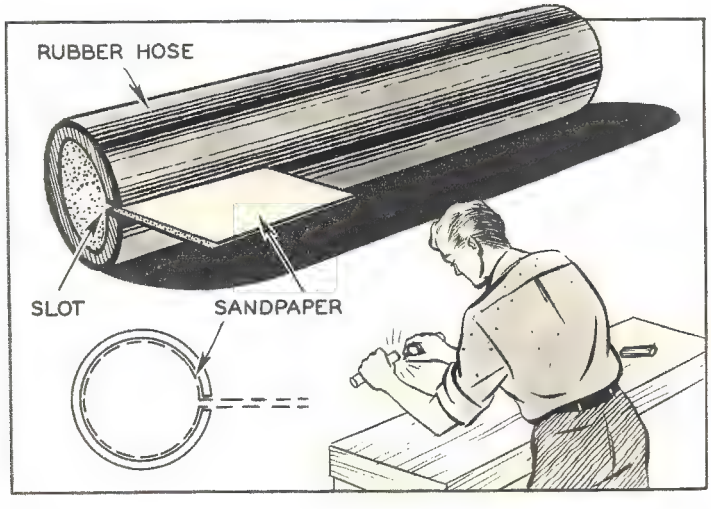
Old Piston Ring Polishes Shafts

A SATISFACTORY shaft polisher can be made from an old piston ring wrapped with twenty to thirty turns of heavy cord. The cord then is soaked in oil and slipped over the shaft. As the shaft revolves, the cleaner will move back and forth, keeping it clean and polished. One of these devices will keep a shaft free from dirt and rust for an indefinite period.



Simple Cleaner Made From Hose

A SIMPLE device for cleaning battery terminals or anything round, can be made quickly and easily from a short piece of rubber hose and a sheet of sandpaper. A slot is cut in the hose and the sandpaper is placed around the inside with the ends protruding through the slots. The hose then is slipped over the object to be cleaned and rapidly rotated.



Build the MI

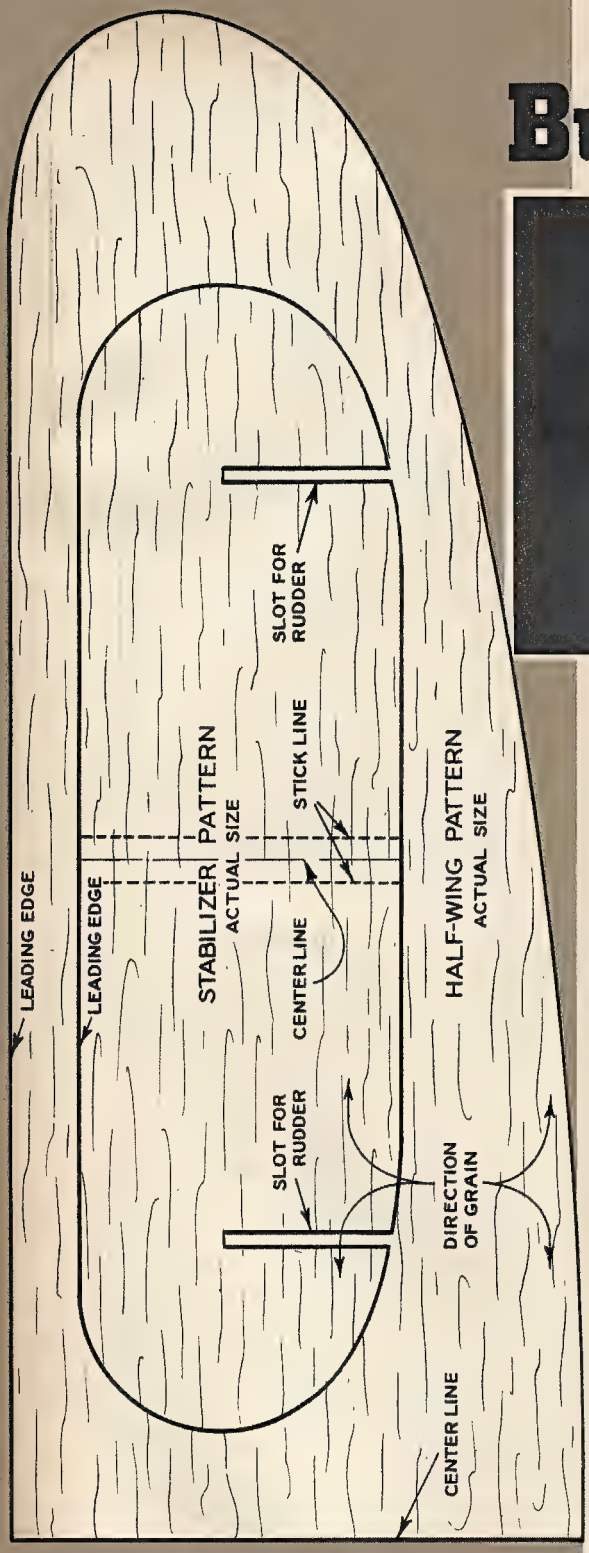
Constructed from materials costing only a few pennies, the twin-rudder "Sky Flea" makes steady flights of 300-400 feet.

by John L. Scherer

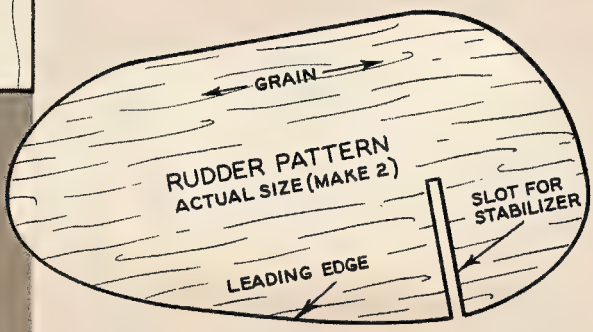
REQUIRING less than one hour to construct and involving the expenditure of only a few pennies for materials, the MI "Sky Flea" will repeatedly make flights of from 300 to 400 feet under average air conditions. The plans for the wing and tail surfaces are full-scale, simplifying the construction problem.

The fuselage or motor stick consists of an 11½-inch length of ⅜x¼-inch balsa stick, sanded to a smooth finish. Cement a propeller thrust bearing to the upper nose end of the motor stick and wind thread tightly around the stick and bearing, as shown in sketch. Cover the wound thread with model cement and allow to dry thoroughly.

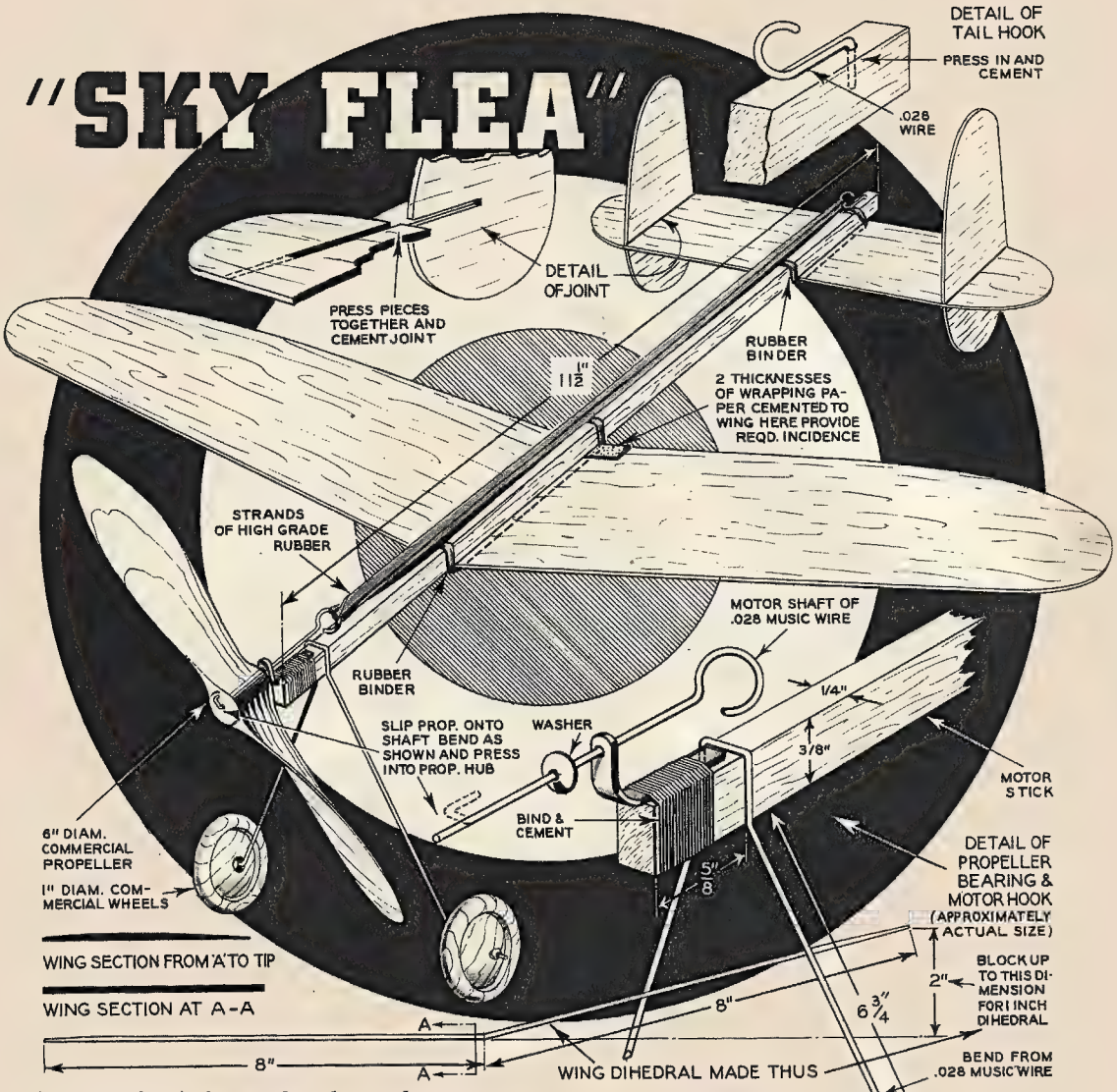
Bend a piece of .028 music wire to form a tail hook and insert it into the upper rear end of the motor stick, dabbing model cement over the spot where the hook pierces the wood. Secure a hard wood propeller of a six-inch diameter, pierce its hub with a motor hook, bent to plan shape, and insert the hook



The sketches above and at right show full-scale patterns for making the "Sky Flea's" wing (two half-sections of equal size), stabilizer and rudders. Balsa sheeting of a ⅛-inch thickness is used and should be sanded smooth to reduce friction in flying through air.



"SKY FLEA"



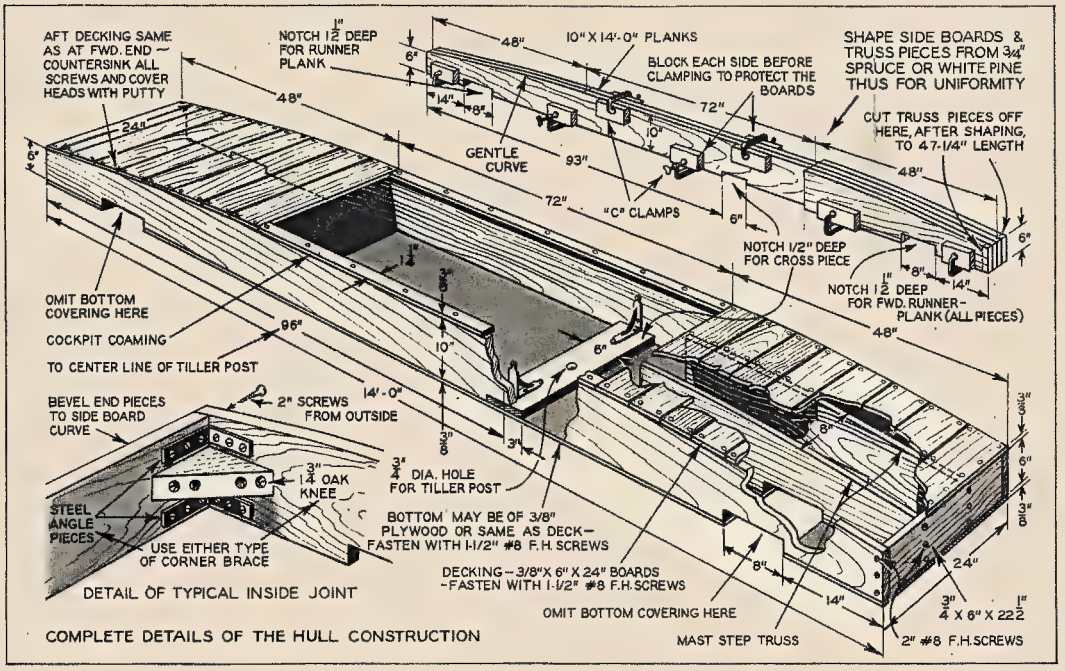
Details of the assembled "Sky Flea" are clearly shown in the sketch above. A hard wood propeller is recommended. To insure stability in flight, the wing of the model should be given dihedral, or mild V-shape, as shown in lower section of the sketch. Below—The unassembled model.

through the hole in the thrust bearing, as shown in sketch. Be sure to place a small washer on the motor hook shaft between the propeller and the thrust bearing. String four strands of high grade ⅛-inch flat rubber between the tail hook and motor hook to power the model. A landing gear, bent to plan shape from .028 music wire and equipped with balsa wheels of a one-inch diameter, completes the fuselage assembly. The legs of the landing gear should be 6¾ inches long from the bent point at the fuselage.

Secure several sheets of standard 18-inch balsa sheeting, 3 inches wide and $\frac{1}{16}$-inch thick and cut out the two 8-inch-long wing halves, stabilizer and twin rudders, using the full-scale plans for a pattern. Sand the sheeting smooth.

A dihedral, or mild V-shape, should be

[*Continued on page* 120]


AFT DECKING SAME AS AT FWD. END — COUNTERSINK ALL SCREWS AND COVER HEADS WITH PUTTY
NOTCH 1 1/2" DEEP FOR RUNNER PLANK
10" X 14'-0" PLANKS
BLOCK EACH SIDE BEFORE CLAMPING TO PROTECT THE BOARDS
SHAPE SIDE BOARDS & TRUSS PIECES FROM 3/4" SPRUCE OR WHITE PINE THUS FOR UNIFORMITY
CUT TRUSS PIECES OFF HERE, AFTER SHAPING, TO 47-1/4" LENGTH
GENTLE CURVE
"C" CLAMPS
NOTCH 1/2" DEEP FOR CROSS PIECE
NOTCH 1 1/2" DEEP FOR FWD. RUNNER-PLANK (ALL PIECES)
OMIT BOTTOM COVERING HERE
COCKPIT COAMING
TO CENTER LINE OF TILLER POST
BEVEL END PIECES TO SIDE BOARD CURVE
2" SCREWS FROM OUTSIDE
3" 1.4 OAK KNEE
3/4" DIA. HOLE FOR TILLER POST
STEEL ANGLE PIECES
USE EITHER TYPE OF CORNER BRACE
BOTTOM MAY BE OF 3/8" PLYWOOD OR SAME AS DECK— FASTEN WITH 1-1/2" #8 F.H. SCREWS
DECKING—3/8"X 6" X 24" BOARDS —FASTEN WITH 1-1/2" #8 F.H.SCREWS
OMIT BOTTOM COVERING HERE
MAST STEP TRUSS
2" #8 F.H.SCREWS
3/4 X 6" X 22 1/2"
DETAIL OF TYPICAL INSIDE JOINT
COMPLETE DETAILS OF THE HULL CONSTRUCTION

BUILD "ICE-SPRITE"

Front view of the four-runner "Ice-Sprite" showing the bow-shaped stays. The drawing above shows hull construction details.

THE four-runner iceboat is here for those who demand the most up-to-date innovation in this thrilling sport.

The four-runner "Ice-Sprite" design has several features embodying greater safety. With four-cornered support, it rears up and hikes less. Moreover, the hull and sail does not tip forward or backward, as do other types. Because the position of the sail is stationary, capsizing is less likely to occur.

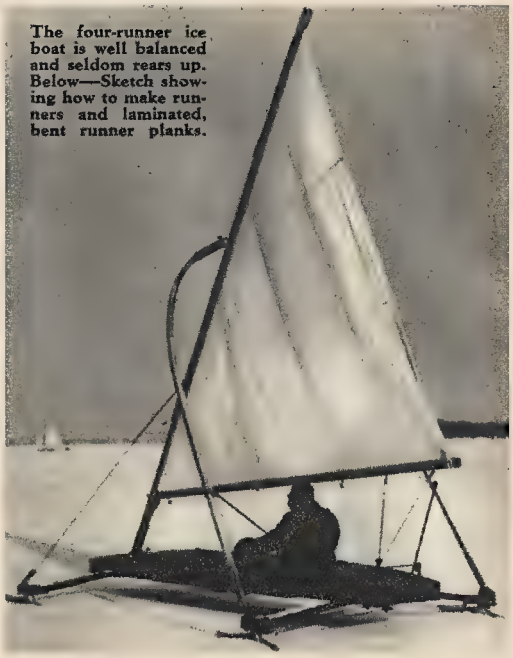
In straight going, the rear runners track in the cuts of the fore runners. Thus with two tracks instead of three, friction is reduced and more speed is possible. As it weighs only 210 pounds, it sails and rides easily with added comfort from two runnerplanks. The cockpit is large enough to accommodate two or three persons.

"Ice-Sprite" will not spin. Designed with even balance, it requires no anti-capsizing skids on the runnerplank ends. The hull is symmetrical so that it can be steered in front equally well by reversing the direction of the runners and stepping the mast reversed on the after deck. The sail area is only 75 square feet.

Build the scow-shaped hull first. Straightforward and simple construction is used throughout and a glance at the hull drawings

by J. Julius Fanta

A FOUR-RUNNER ICE BOAT



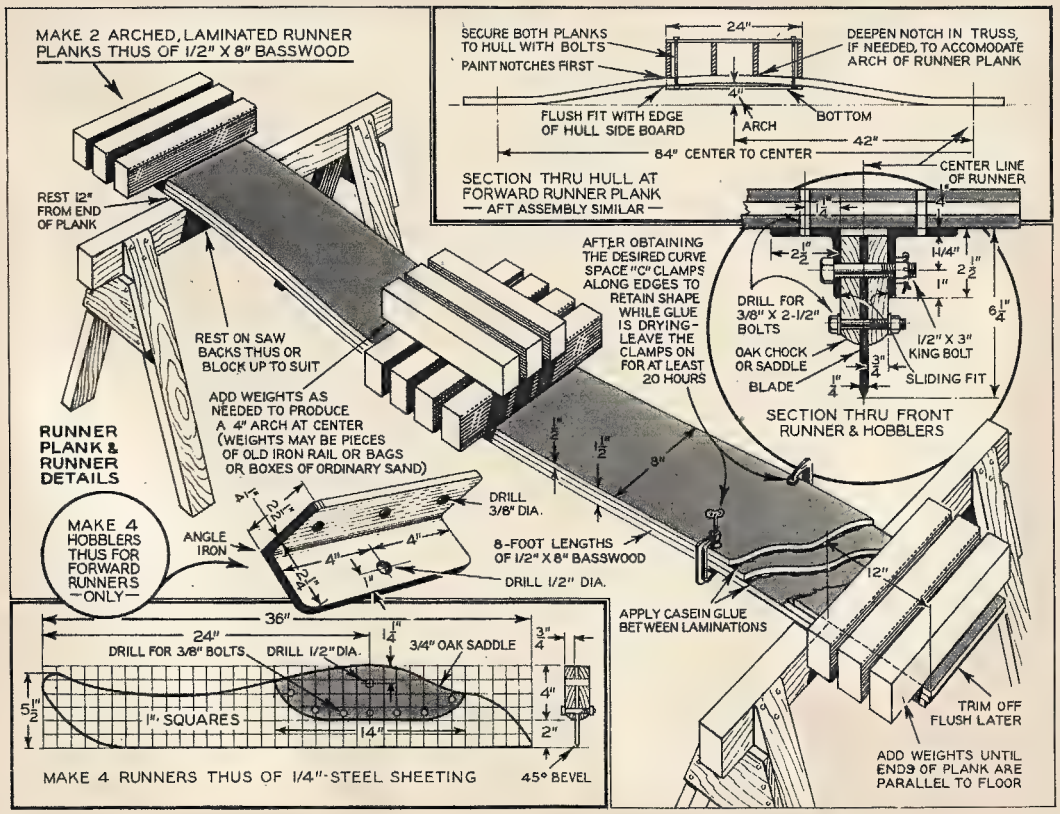
The four-runner ice boat is well balanced and seldom rears up. Below—Sketch showing how to make runners and laminated, bent runner planks.

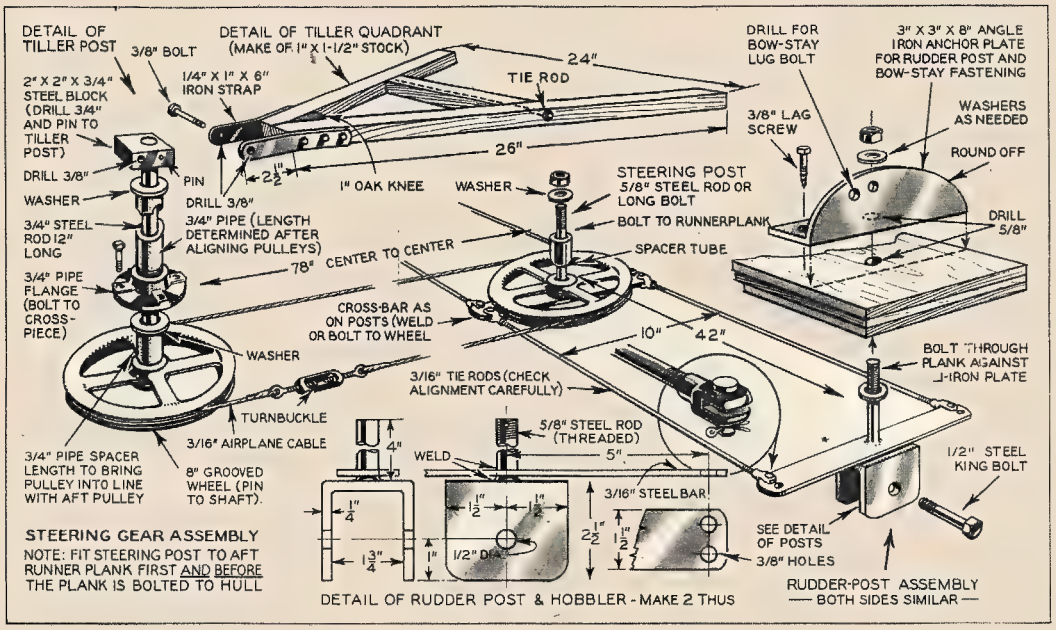
will quickly show the necessary details and dimensions to be observed. Any good grade lumber may be used for the 14-foot side boards but ¾-inch clear white pine or spruce is recommended.

The two 14-foot boards and the two 48-inch truss members which brace the mast step should be clamped together as shown and shaped and mortised as a single unit. This ensures uniformity. The notches for the runnerplanks are 1½ inches deep to take the planks flush.

Put in the ¾x6x22½-inch end boards and brace the corners either with oak knees or with corner irons as shown in the detail sketch. A further cross member of ½x6-inch stock is put in to stiffen the structure and to serve as a base for the tiller post.

Leaving entrance for the runnerplanks, cover the entire bottom with ⅜x6-inch boards or ⅜-inch plywood. Now drill through the cross-member and bottom for


MAKE 2 ARCHED, LAMINATED RUNNER PLANKS THUS OF 1/2" X 8" BASSWOOD
SECURE BOTH PLANKS TO HULL WITH BOLTS
PAINT NOTCHES FIRST
24"
DEEPEN NOTCH IN TRUSS, IF NEEDED, TO ACCOMODATE ARCH OF RUNNER PLANK
FLUSH FIT WITH EDGE OF HULL SIDE BOARD
ARCH
BOTTOM
42"
84" CENTER TO CENTER
SECTION THRU HULL AT FORWARD RUNNER PLANK — AFT ASSEMBLY SIMILAR —
CENTER LINE OF RUNNER
REST 12" FROM END OF PLANK
REST ON SAW BACKS THUS OR BLOCK UP TO SUIT
AFTER OBTAINING THE DESIRED CURVE SPACE "C" CLAMPS ALONG EDGES TO RETAIN SHAPE WHILE GLUE IS DRYING—LEAVE THE CLAMPS ON FOR AT LEAST 20 HOURS
DRILL FOR 3/8" X 2-1/2" BOLTS
OAK CHOCK OR SADDLE
BLADE
1/2" X 3" KING BOLT
SLIDING FIT
SECTION THRU FRONT RUNNER & HOBBLERS
ADD WEIGHTS AS NEEDED TO PRODUCE A 4" ARCH AT CENTER (WEIGHTS MAY BE PIECES OF OLD IRON RAIL OR BAGS OR BOXES OF ORDINARY SAND)
RUNNER PLANK & RUNNER DETAILS
MAKE 4 HOBBLERS THUS FOR FORWARD RUNNERS —ONLY—
ANGLE IRON
DRILL 3/8" DIA.
DRILL 1/2" DIA.
8-FOOT LENGTHS OF 1/2" X 8" BASSWOOD
APPLY CASEIN GLUE BETWEEN LAMINATIONS
36"
24"
DRILL FOR 3/8" BOLTS
DRILL 1/2" DIA.
3/4" OAK SADDLE
1" SQUARES
14"
MAKE 4 RUNNERS THUS OF 1/4"-STEEL SHEETING
45° BEVEL
TRIM OFF FLUSH LATER
ADD WEIGHTS UNTIL ENDS OF PLANK ARE PARALLEL TO FLOOR


DETAIL OF TILLER POST
3/8" BOLT
DETAIL OF TILLER QUADRANT (MAKE OF 1" X 1-1/2" STOCK)
24"
TIE ROD
2" X 2" X 3/4" STEEL BLOCK (DRILL 3/4" AND PIN TO TILLER POST)
1/4" X 1" X 6" IRON STRAP
26"
DRILL 3/8"
PIN
2½"
1" OAK KNEE
WASHER
STEERING POST 5/8" STEEL ROD OR LONG BOLT
DRILL 3/8"
3/4" PIPE (LENGTH DETERMINED AFTER ALIGNING PULLEYS)
3/4" STEEL ROD 12" LONG
BOLT TO RUNNERPLANK
78" CENTER TO CENTER
SPACER TUBE
3/4" PIPE FLANGE (BOLT TO CROSS-PIECE)
CROSS-BAR AS ON POSTS (WELD OR BOLT TO WHEEL
10"
42"
WASHER
3/16" TIE RODS (CHECK ALIGNMENT CAREFULLY)
TURNBUCKLE
3/16" AIRPLANE CABLE
5/8" STEEL ROD (THREADED)
4"
WELD
5"
3/4" PIPE SPACER LENGTH TO BRING PULLEY INTO LINE WITH AFT PULLEY
8" GROOVED WHEEL (PIN TO SHAFT).
3/16" STEEL BAR
STEERING GEAR ASSEMBLY
NOTE: FIT STEERING POST TO AFT RUNNER PLANK FIRST AND BEFORE THE PLANK IS BOLTED TO HULL
1/2" DIA.
SEE DETAIL OF POSTS
3/8" HOLES
DETAIL OF RUDDER POST & HOBBLER - MAKE 2 THUS
DRILL FOR BOW-STAY LUG BOLT
3" X 3" X 8" ANGLE IRON ANCHOR PLATE FOR RUDDER POST AND BOW-STAY FASTENING
3/8" LAG SCREW
WASHERS AS NEEDED
ROUND OFF
DRILL 5/8"
BOLT THROUGH PLANK AGAINST L-IRON PLATE
1/2" STEEL KING BOLT
RUDDER-POST ASSEMBLY — BOTH SIDES SIMILAR —

The steering gear assembly is simple, but strong. By crossing the cables, the tiller action will be positive, as in an auto.

the ¾-inch diameter tiller post. The mast truss boards are next fitted and screwed to the front end board and to the bottom. This truss serves to distribute the down pressure of the mast and should be spaced as shown in the drawings (page 90). Lay the deck in the same manner as the bottom and fit the cockpit coaming strips, which are made of 1¼-inch plywood, ⅜-inch thick. The decking, if planked, should now be filled along the seams with a mixture of putty and white lead and the entire hull sanded down before applying three coats of either varnish or paint. Pay particular attention to paint the runnerplank notches to prevent rot at these points, eliminating trouble later.

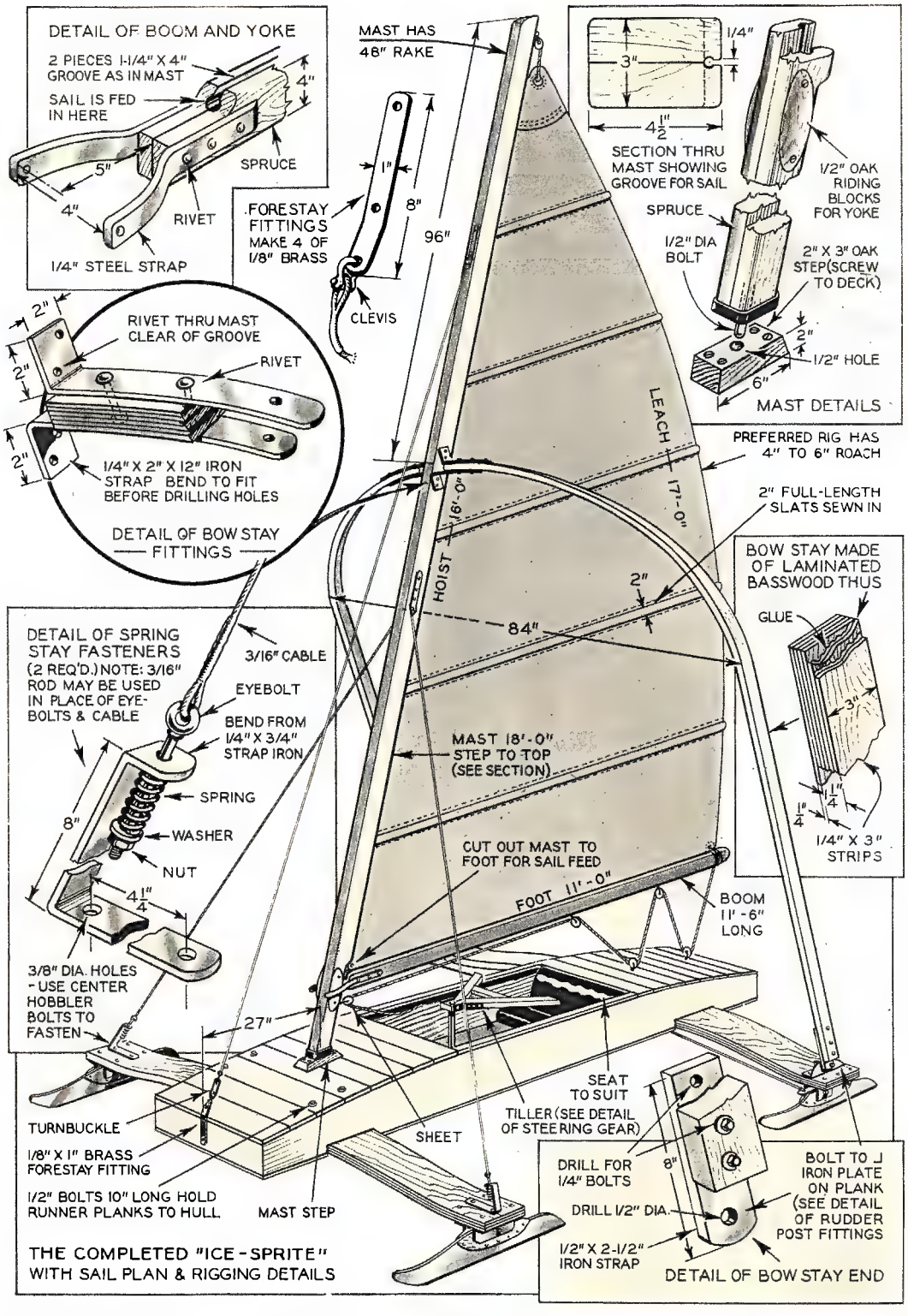
The runnerplanks are now constructed. They are exactly alike and are built up of three laminations of ½-inch basswood, as shown in the drawings on page 91, and held together by casein glue. It should be mixed with cold water to a heavy consistency. When the planks have been arched to the correct curves clamp them with "C" clamps and allow at least 20 hours for drying before removing the clamps.

The planks may be attached either with ½-inch bolts through the deck as shown or with corner plates bolted through planks and side boards. Either method is satisfactory but before bolting the runnerplanks in place the runners, front hobblers and the steering gear elements should be made. It will be noticed that two sets of front hobblers are required and two pivoted hobblers or rudder posts support the aft or steering runners.

Make the 4 identical runners to the plans given, cutting them from ¼-inch steel sheeting and then drilling for the oak saddle pieces and for the ½-inch pivot or king bolts. This work is best taken

[*Continued on page* 121]

This close-up of the hull shows the arched runnerplanks which absorb the shock of traveling over rough ice. Note the springs on mast-stay fittings, another practical innovation.



This drawing shows the completed "Ice Sprite" and clearly indicates the sail plan and numerous rigging details. Runners and metal parts should be finished with aluminum paint to prevent rust. Seat and backrest are left to builder's discretion.

Northern Snowshoes

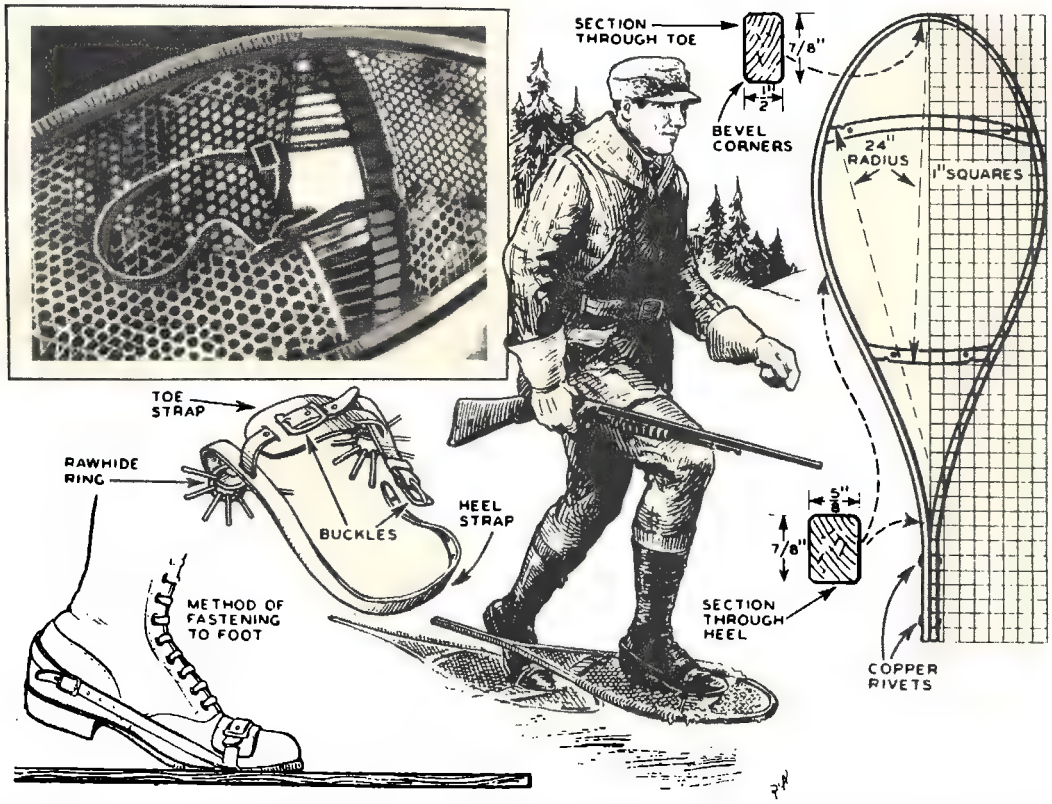


Fig. 1. Sturdy and durable, these snowshoes are ideal for hunters and trappers. Photo shows completed snowshoe, while below it is the toe strap detail. Frame is bent according to dimensions given in squared pattern and secured with copper rivets.

by Hi Sibley

TRAPPERS, hunters, winter hikers and outdoor men in general will find these simple snowshoes just the thing for negotiating the landscape when the snow is piled neck deep all over the scene. The design was taken from a pair of genuine Canadian snowshoes, so you can be sure that you will be constructing the real thing.

Construction presents no real difficulties and cost has been reduced to a minimum. Some care will be required, however, in bending the toe of the frame, and in getting the rawhide lacing tight. In fact, the success of the project depends largely upon these two factors.

Select two straight-grained pieces of hickory 8 feet long and ⅞-inch wide at the center, which is to be the point of the toe. Begin 32 inches from the ends, and plane one side only, which will be the inside when the frame is bent, as shown in Fig. 2.

After the corners are beveled the frame members should be thoroughly steamed before attempting to bend them. This can be done by placing them in an 8-foot section of old rainspout or a long box, tying a cloth with small vent over one end and inserting the spout of a tea kettle in the other as shown in Fig. 2.

The outer end should be elevated a foot or so, and steaming continued for at least an hour.

Prepare a form around which the sticks are to be bent, laid out as shown in the squared chart in Fig. 1. This can be nailed to a cellar or garage door, where it is exposed to the sun. Do not attempt to bend to the final shape all at once, but work it around gradually to ease the strain.

Thwarts, or cross-members made of hickory, as shown in Fig. 2, should be in-

Are Easy To Make

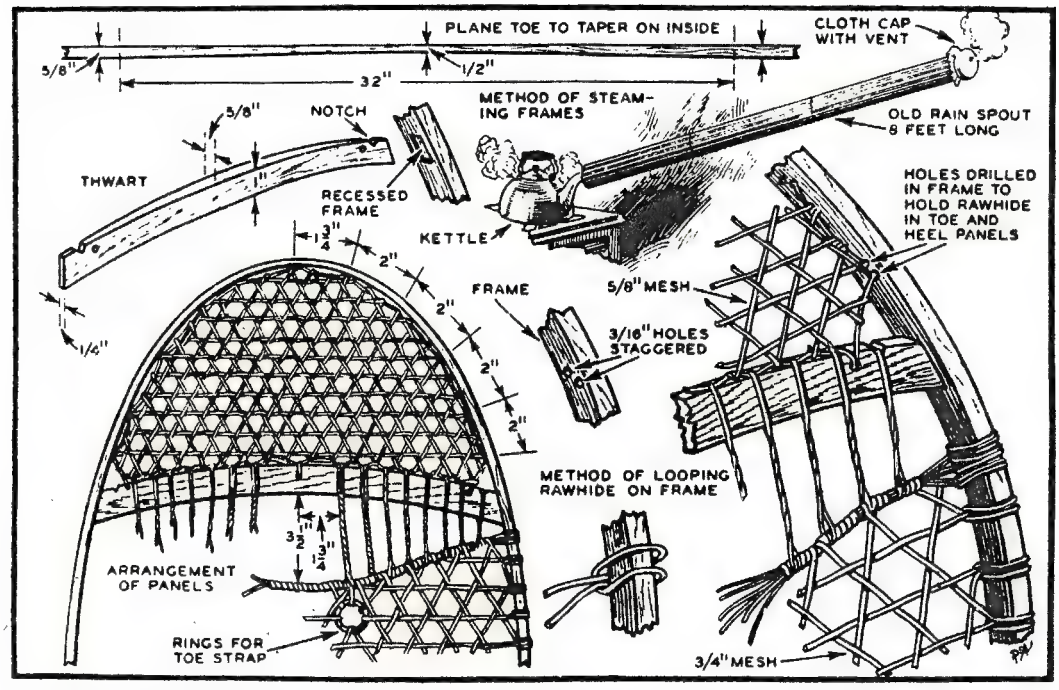


Fig. 2. The various steps in the bending of the snowshoe frames and weaving of rawhide thongs are illustrated above. Bend the frames slowly so that they do not break and draw the thongs as tight as possible. The detail at extreme right shows the manner in which thongs are secured to thwart and frame, and in heel and toe sections. Frames are protected with linseed oil.

stalled just before the heel ends are brought together and riveted. Note that the ends of the thwarts are set in mortises or recesses in the frame, chiseled about ¼-inch deep. Secure the heel ends together with copper rivets or $\frac{3}{16}$-inch brass bolts located, as shown in Fig. 1.

The frame is now ready for lacing. For the toe panel use strips of rawhide about ⅛-inch wide. Fig. 2 gives the general arrangement of the rawhide, but do not expect the finished job to have any such geometric regularity. The utility will not be affected.

Beginning at the toe drill a pair of $\frac{3}{16}$-inch holes, staggered and about ¼-inch apart, and 1¾ inches on each side drill two more holes with four more pairs down each side, spaced 2 inches apart. These are for anchoring the rawhide loops which hold the lacing.

Each pair of loops along the edge of the frame should be drawn as tight as possible. Tie each pair separately so that when they are all completed, the edge of the front section of the frame will consist of individual units. The heel panel is laced in a similar manner.

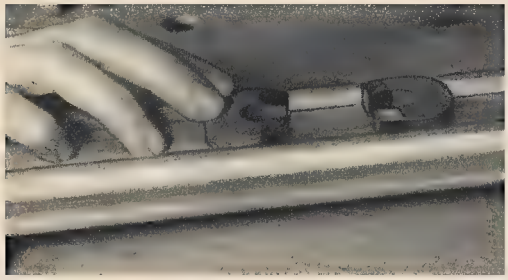
For the central panel which supports the foot directly, use $\frac{3}{16}$-inch strips of rawhide, arranged as shown in Fig. 2, with an open space in the center just above the user's toe, and two rawhide rings for receiving the foot strap. Note that in the central panel the thongs are looped over the frame.

No matter what the finished appearance, the snowshoes will perform satisfactorily if all the thongs are taut, but if they are loose the shoes will be very difficult to use. A toe-and-heel strap is made as shown in Fig. 1 and looped through the two rawhide rings.

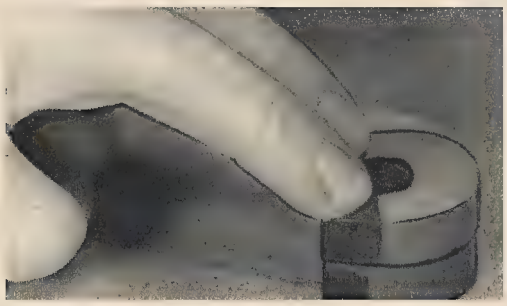
A little practice will quickly give you the knack of walking on snowshoes. When moving forward the shoes are dragged close to the snow, rather than lifted, as in the case of skis. One shoe is advanced to the point where the heel section of the front shoe fits around the side of the toe section of the rear shoe, and so on. Turning is a matter of swinging one shoe completely around in the opposite direction and following it with the second shoe, which is brought up alongside the first. You'll soon acquire all the tricks in the trade.

EXPERIMENTS

Magnets made of the new aluminum-nickel-steel alloys show amazing lifting power. They are capable of holding as much as fifty times their own weight in soft iron. These magnets are finding wide application in radio loudspeakers where they provide considerably greater power and improved tonal quality.

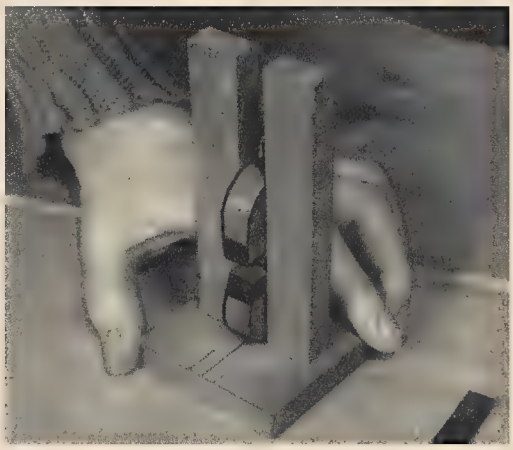


The repulsion powers of these magnets are so great that the magnet at the right is backing up as the one on the left is pushed forward. A wooden rail is necessary to keep the magnets from turning to bring unlike poles together.

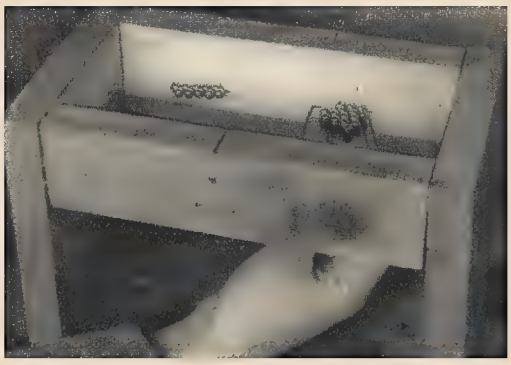


Like poles of a magnet repel each other. When the north and south poles of the two magnets are placed together as shown, the top magnet will be thrown upward several inches from the lower one when the fingers are suddenly removed.

So powerful are these new magnets that they are capable of exerting their influence even though they are separated a considerable distance from another piece of magnetic metal. Here a small magnet is held in defiance of gravity by its keeper separated from it by the thickness of a piece of glass.



A small wooden frame prevents the magnets from bringing their unlike poles together, and thus permits the lower magnet to lift the upper one clear of it. It will hold the position shown in the photograph above for an indefinite period

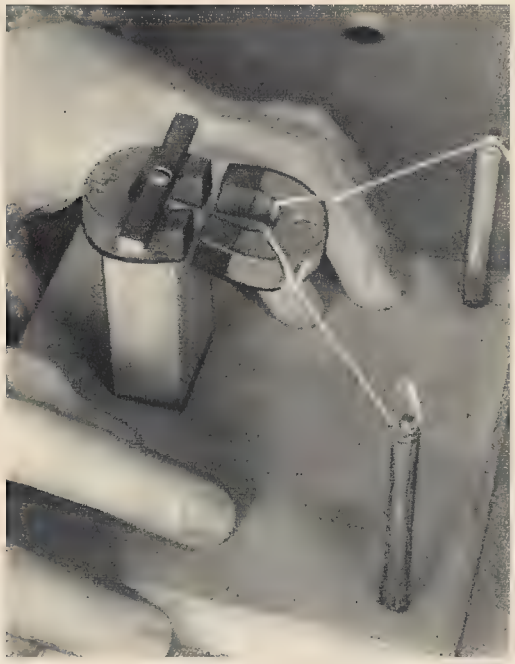


If a small table with a glass top is made as shown, many hours of fun can be had by marshalling small steel balls about, with the help of a magnet held underneath. Inasmuch as the balls immediately become magnetized, they tend to arrange themselves in definite magnetic patterns.

WITH MAGNETS

The power of these new magnets is so great that a long string of steel balls can be lifted intact. To accomplish this, the balls should be lined up in a small grooved board as shown above.

As many as ten steel blocks can be balanced on one pole of these new magnets if the experimenter's hand is very steady. The ends of the blocks must be perfectly square to make this experiment a success. Be sure that the face of the magnet on which the pieces are piled, is perfectly level and steady.



The more powerful a magnet is, the more it will tend to point to the magnetic north pole. Ordinary magnets do not show a very pronounced motion, but the new alloy magnets fully demonstrate the action when at the end of a string as shown.

In this beaker of water a small piece of steel is prevented from sinking by the magnet held near the outside of the glass. If very thin pieces of sheet steel are used, the magnet can be held as far away as one inch with the same result.

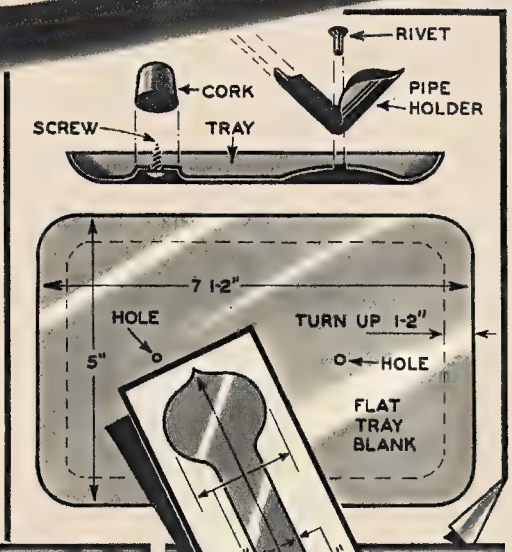
Here is a magnet suspended on nothing but thin air. It is attracted to the anchored magnet with such force that gravity does not force it to fall, even though it is separated from the stationary magnet by approximately a quarter of an inch.

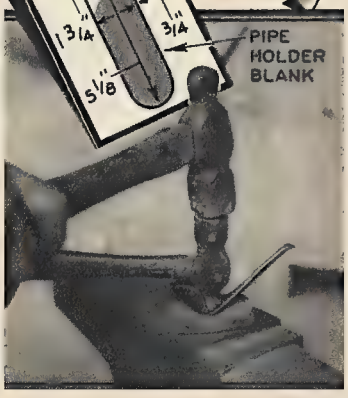
COMBINATION PIPE RACK AND TRAY

THE construction of this tray illustrated will not only give the pipe-smoking craftsman something interesting to make but will prove to be useful for decorating a reading table or desk. The tray itself is of 18 gauge soft sheet copper, 5" wide by 7½" long, and is raised to a depth of about ½".

After the tray has been shaped and trued up, turn the piece over and with the ball end of a hammer, raise a mound about 1¾" in diameter in one end, upon which the pipe holder will rest. Raise another mound about ¾" in diameter in the other end. To square

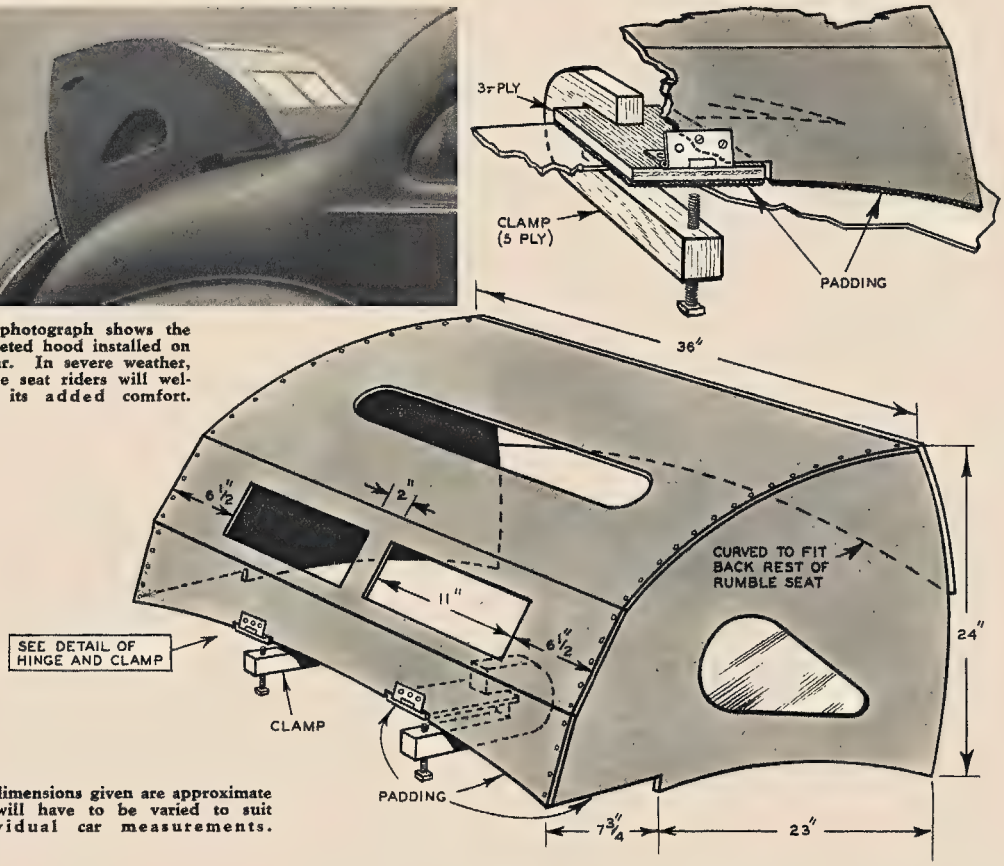
[*Continued on page* 118]





Easily Made Cover Protects Rumble Seat Riders

This photograph shows the completed hood installed on the car. In severe weather, rumble seat riders will welcome its added comfort.

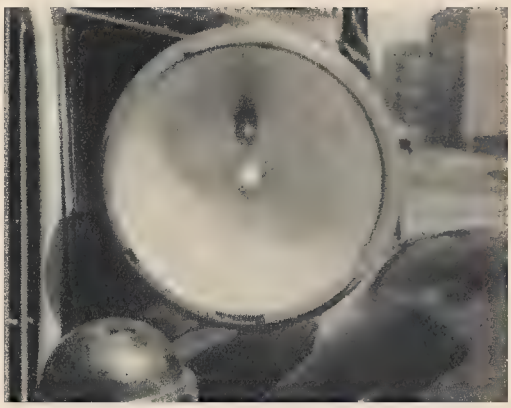


The dimensions given are approximate and will have to be varied to suit individual car measurements.

IN SEVERE weather, rumble seat riding at times becomes very uncomfortable. However, the rumble seat cover shown above will eliminate all discomfort caused by weather, and can be made easily and inexpensively by any car owner. Because the dimensions vary according to car and model, the measurements given above are approximate and will have to be changed to suit individual conditions. When fitting the cover to the car, be sure to make all joints tight enough to prevent rain from coming in, but, at the same time, some provision for adequate ventilation should be provided. If there is any possibility of exhaust fumes coming into the compartment from the under part of the car, the hood should not be used until this condition is completely corrected.

Plywood or prestwood is used for the sides, back and top. The material for the windows can be taken from a pair of old side-curtains, or can be purchased at almost any auto supply store. They are fastened in place with glue.

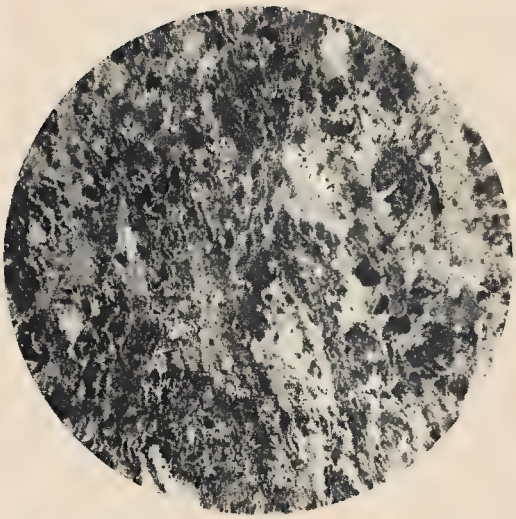
Paste Cleans Reflectors



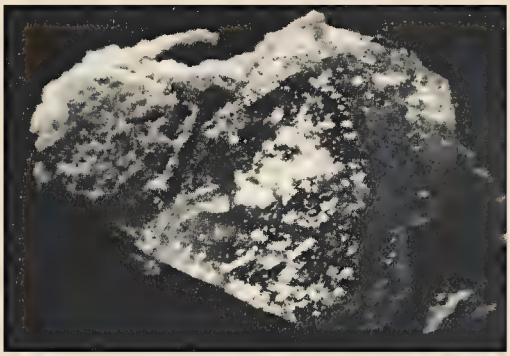
ALMOST all headlight reflectors become dirty after a few months of use. They can be cleaned and polished easily and without damage or scratching by using ordinary toothpaste as the cleaning material.

MINERALS MAKE COLORFUL

A circular pill box with sunstone specimen mounted on a cork pyramid in the center, for low power examination with strong reflected light. The box interior is painted black.



A professional slide of chlorite schist prepared as a thin section for study by transmitted light. Such a slide reveals the details of rock structure.



Photograph of a pill-box mount of sunstone by reflected light. The crystals that appear as white in the photograph, actually are all the colors of the rainbow.

IF BEAUTY is a quality to be sought for its own worth, then beautiful objects are to be desired whether or not they possess other values. Hence the amateur microscope enthusiast often searches for materials to delight the eye regardless of other considerations, and among the many sorts of natural objects thus prized minerals easily head the entire list, for in minerals beauty of color and beauty of form often go hand in hand and frequently require magnification for their full appreciation. In most cases the technique is very simple and quite naturally the subject is a favorite one with many an owner of a microscope. Some examples will make these points clear.

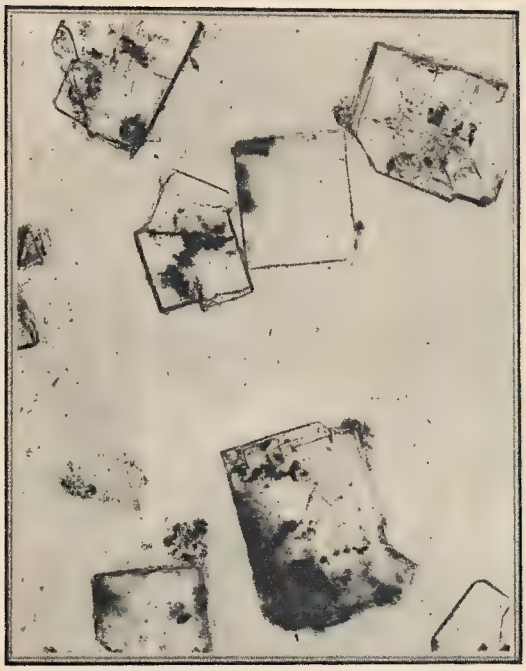
The pillbox mount of mineral specimens is designed for low power examination by reflected light. From your druggist, secure a number of small pillboxes preferably of the cubical type and some cork stoppers or sheet cork. For each box construct a small pyramid of cork and affix by its base to the bottom interior of the box with balsam. Paint the cork and box interior black. The pyramid should raise the mineral specimen about halfway up from the bottom of the box. Cement the mineral to the apex of the cork, label the box lid appropriately, and keep stored with the lid on when not in use.

Many minerals are suitable for these mounts. Among them are: crystallized specimens of native gold, silver and copper; very small examples of diamond; asbestos fibers of several types; pieces of precious opal and opalized wood; and crystal groups of azurite, malachite, cuprite, garnet, mimetite, vanadinite, sunstone, gypsum, galena, halite, fluorite, calcite, jamesonite, mordenite and many others. Small clusters for box mounts may be obtained from dealers at trifling cost.

Examine the specimens with the lowest available magnification. If you have a standard laboratory instrument, unscrew the front combination of the low power (16mm) objective, thus converting this lens into one of 32mm, coming to a focus at a much higher level and reducing the power from 10X to 4X. With a 5X eyepiece, this means a total reduction from 50X to 20X, the ideal magnifi-

MOUNTS FOR THE MICROSCOPE

by Julian D. Corrington, Ph.D.



Crystals of potassium ferricyanide photographed with ordinary light. Compare this with the photograph at the right.

The same slide under polarized light, showing greater detail. Unfortunately this photo cannot reveal the beauty of colors.

cation for this work. A lens recently placed on the market and known as a bifocus objective is designed to make this change instantly by the flip of a lever.

One can purchase a separate 32mm or 48mm lens, if desired, and screw this onto the microscope nosepiece for low power work, and it is also possible to secure especially long oculars with a power of only 2X. For miniature models, in which the objective cannot be taken apart, special low power eyepieces are available; in the case of one popular model the resulting magnification is the desired 20X.

Illumination is a most important consideration in this work. It must be strong and directed down into the box mount from above, either by placing a lamp source correctly, or by using a small mirror, such as that for a lady's vanity case or compact, fastened to the microscope tube with wire or brass collar, and tilted to direct light rays downward. Many amateur microscopes have detachable substage mirrors which can be removed and plugged in above the stage for reflected lighting purposes.

Mineral specimens may also be mounted on slides, a method preferred by many. Obtain some small bone embroidery rings and cement one of these to a slide. Cut a circular piece from black photomount paper so that it will fit snugly within the ring and cement this to the slide also. Then paint the ring black. Cement in the mineral crystals and warm the slide to drive off all moisture, and seal on a circular cover glass of the proper size. Note that the deep-well slide thus made contains air and is not to be filled with balsam.

It is good practice to "flame" the cover glass first; hold with a forceps and pass rapidly several times, both surfaces, through the apex of a flame such as that from a bunsen burner or alcohol lamp. This drives off all traces of moisture and is especially necessary in humid climates. Should moisture be present within the well, it will collect as a fine mist on the under surface of the cover, which then must be removed, the well dried thoroughly, and a new cover applied.

Various sands make interesting deep-well mounts. Prepare the black well as before. Sprinkle a small amount of a given sand upon

[*Continued on page* 124]

Automatic Hot Air Heater

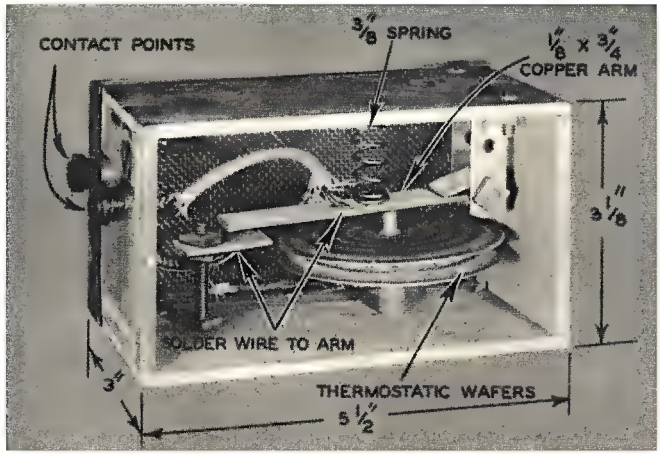
CAPABLE of maintaining a comfortable room heat in zero weather, this automatic hot air heater is an ideal unit for the small shop or office. It is efficient and economical in operation, and, with thermostatic control, requires no attention other than adding to the water supply in the radiator from time to time.

The mechanics of the installation can be seen in the photographs. The heating unit is the familiar coil-type gas heater. This heats the water, which, when hot, rises to the top of the radiator. A fan mounted behind the radiator sends a warm current of air out into the room. The water returns to the heater and continues to circulate. A pipe leading from the return water line connects to a thermostat, the thermostat checking or turning on the gas according to the heat of the water.

The dimensions given are a fair standard, but can be varied to suit. It can be seen that the width of the angle-iron framework must be made to fit the width of the car radiator selected for the job. The coil heater is of medium size and costs approximately five dollars.

Above—The completed heater just before the sheet metal covering is fastened in place. The thermostat for turning the fan on or off is not shown in this photograph. The fan should have 12 to 15-inch diameter blades.

Right—This is a home-made thermostat used for turning the electric fan on or off. With the exception of the wafers, all the parts are of the type found in the average home workshop. The wafers are the type that can be purchased at most electrical or hardware stores.

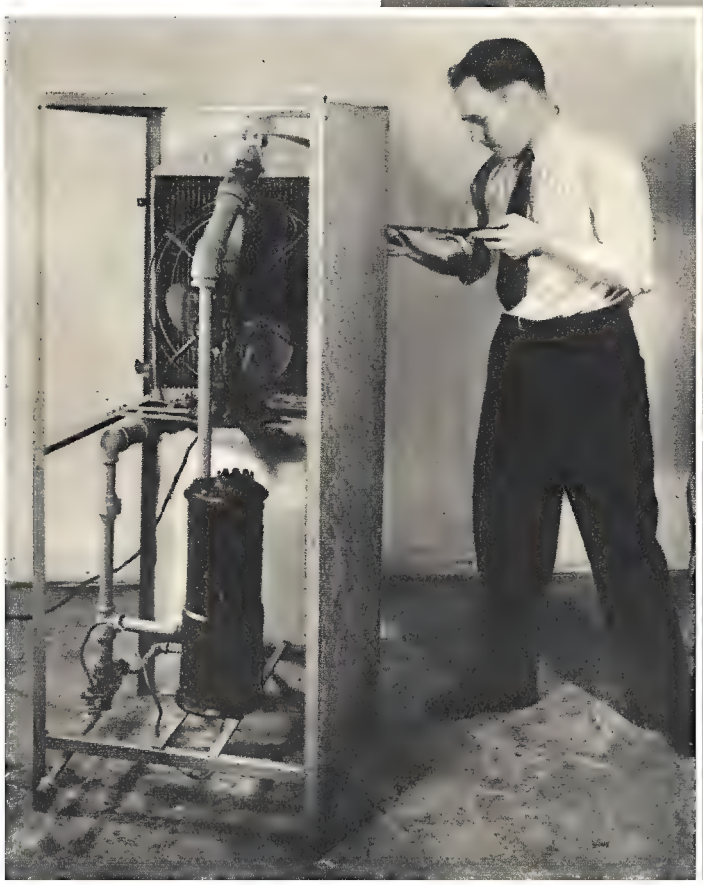


for Shop or Office

by Robert Gregg

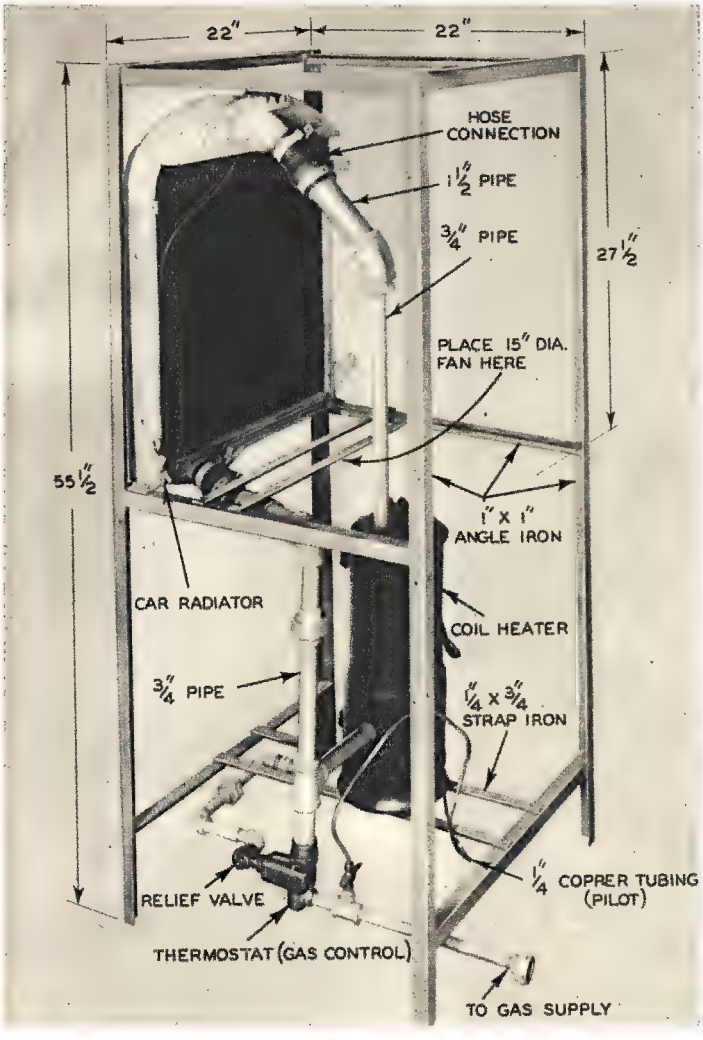
The fan should be about 12 to 15 inches in diameter. If this is not available, two smaller fans can be used. The thermostat is a standard type for controlling the flow of gas when used for heating water. It can be set for any temperature from 100 to 160 degrees, and will control the flow to maintain the temperature for which it is set. A setting of about 150 degrees is recommended for the unit shown.

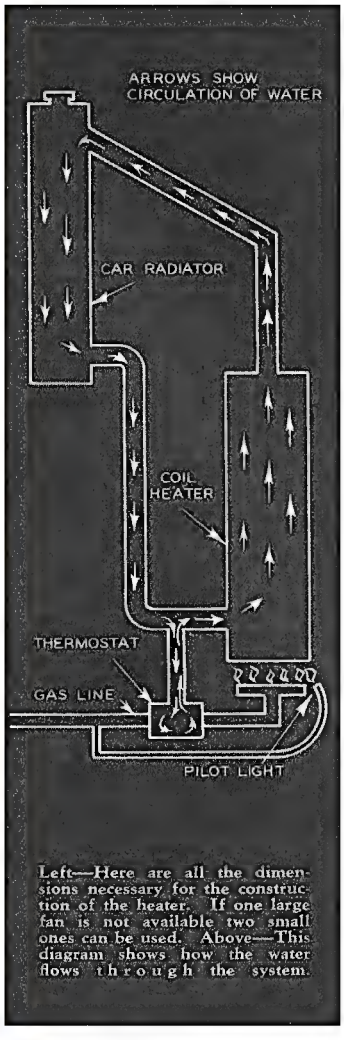
A second thermostat controls the fan. This type of thermostat can be purchased at a nominal cost or made as shown in the photograph. Two thermostatic wafers are re-



Above—The finished heater covered with sheet metal. The top should be removable so that water can be added to the radiator when needed. In most locations it will not be necessary to cover the back. One or two coats of paint of a color to match the rest of the room will greatly improve its appearance.

The heater should be fitted with a stack so that the burned gas fumes will be led outside. Bolts and nuts can be used to hold the outside covering in place.





Left—Here are all the dimensions necessary for the construction of the heater. If one large fan is not available two small ones can be used. Above—This diagram shows how the water flows through the system.

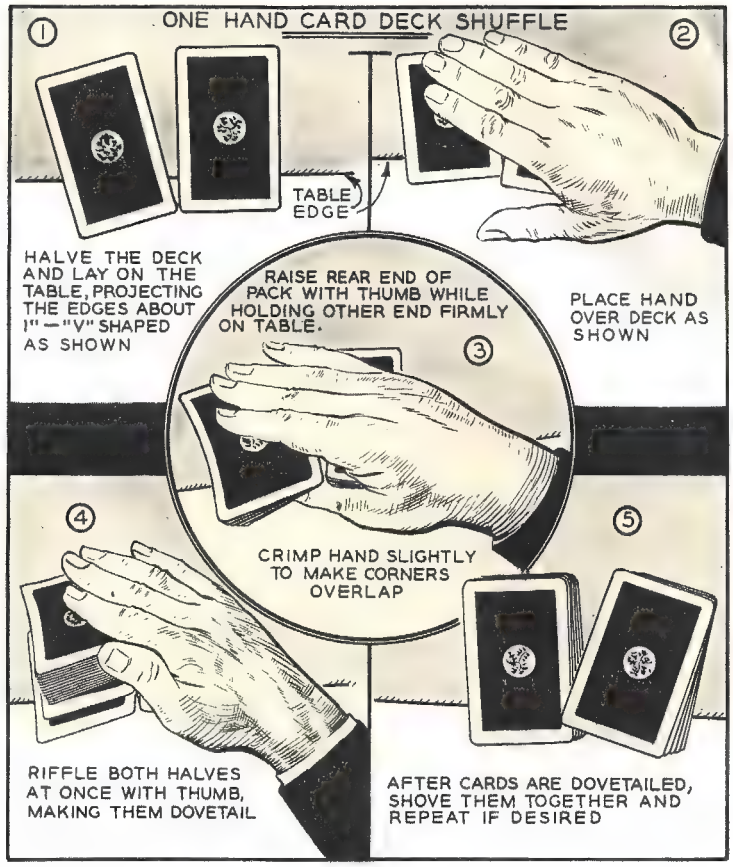
quired. These are the type used in chicken brooders, and are obtainable at any hardware store handling farm supplies. The cost is about twenty cents. The disks are mounted in a small wooden or metal box so that they will actuate a metal arm and thus open or close the circuit to the fan. It will be necessary to experiment a little with the spring which holds the arm down on the wafers to determine the pressure required for the thermostat to close at a comfortable room temperature.

Where expenses must be considered, the thermostatic controls can, of course, be eliminated. If this is done, the fan runs continuously, while the gas pressure is adjusted from day to day to meet varying temperature conditions. To improve its appearance the bare framework of the unit should be covered with sheet metal, with a removable metal top to permit adding water to the radiator. It will probably not be necessary to cover the back, because this is usually against a wall and out of sight. The heater should preferably be fitted with a stack so that gas fumes can be carried to the outside. If used in any location where a stack would prove unsightly, the heater can be fitted with a flue cap filled with steel wool, the same installation as used on kitchen stoves.

This type of heater is particularly applicable for places requiring rapid heating facilities. If it is turned off during the night, almost immediate heat will be obtained the next morning when it is turned on, thus eliminating that long no-heat period found in some heaters.

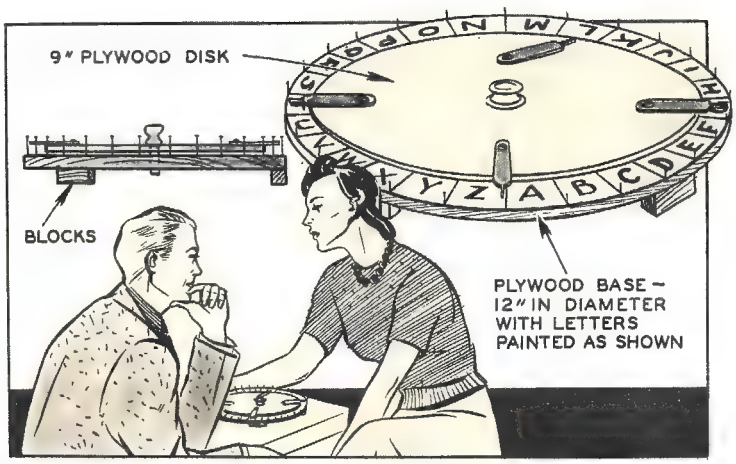
Shuffle A Deck Of Cards With One Hand

A DECK of cards can be shuffled easily with one hand if these directions are followed closely: Divide the pack into two parts and place them on the edge of the table. With the hand over the two piles as shown in step 2, raise the front edges of the piles with the thumb and riffle both halves at the same time. If the preceding steps have been carried out correctly the cards should fall into perfect dovetail order. The pack must overlap the edge of the table about one inch for best results, and both halves should be riffled at the same speed to obtain an even dovetail. After the cards are dovetailed, shove the two piles together, even them up and repeat if desired. After a little practice the entire operation will be completed easily and quickly.


ONE HAND CARD DECK SHUFFLE
1
2
TABLE EDGE
HALVE THE DECK AND LAY ON THE TABLE, PROJECTING THE EDGES ABOUT 1" — "V" SHAPED AS SHOWN
RAISE REAR END OF PACK WITH THUMB WHILE HOLDING OTHER END FIRMLY ON TABLE.
3
PLACE HAND OVER DECK AS SHOWN
4
5
CRIMP HAND SLIGHTLY TO MAKE CORNERS OVERLAP
RIFFLE BOTH HALVES AT ONCE WITH THUMB, MAKING THEM DOVETAIL
AFTER CARDS ARE DOVETAILED, SHOVE THEM TOGETHER AND REPEAT IF DESIRED

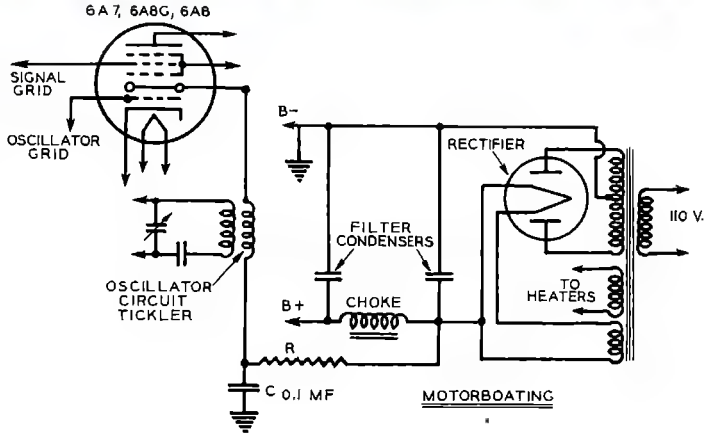
New Letter Game Adds Enjoyment To Parties

THIS exciting word game can be played by small or large groups and never fails to excite interest. Any number of players from two up can take part, and the more the merrier. One player spins the wheel and when the pointer or pointers come to a stop, the first player to give a word containing the letter or letters pointed to, wins the spin. The first player to score ten pins is the winner. The four pointers are fastened in place with screws and are adjusted so that they can be turned away from the edge, thus reducing the number of necessary letters in the words to be selected. As the players become more skillful, more pointers can be used. This game is especially interesting to cross-word puzzle fans.



RADIO SPARKS

Motorboating Is Easy To Eliminate



MANY radio receivers motorboat when a strong signal is received. Under these conditions, the set sounds as though the station were broadcasting machine-gun fire. When a comparatively weak station is tuned in, the set works perfectly and all search for trouble is in vain.

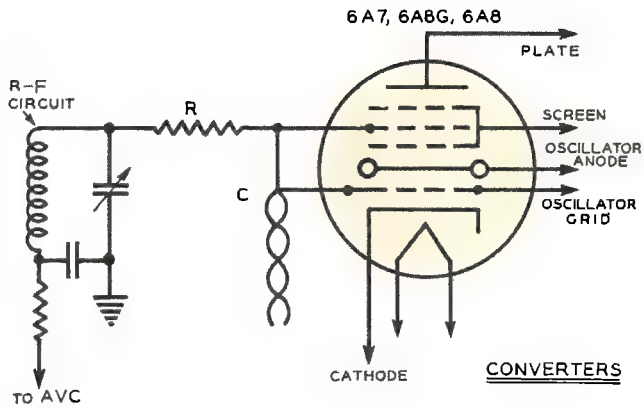
Trouble of this sort has often been found to be caused by changes in oscillator voltage with signal. When a strong signal is tuned in, the current drain of the set rises and the B voltage falls as a consequence. The reduced B voltage on the oscillator plate changes the oscillator frequency enough to detune the station, and the B voltage rises again. The rise and fall of signal strength is the motorboating.

Fortunately, the remedy is simple: disconnect the B-plus lead to the oscillator anode and connect it through a separate resistor to the high-voltage side of the filter choke, as shown in the sketch. Bypass the resistor to ground through a condenser (C). The value of R is easy to determine: increase its value until the voltage at the oscillator plate is 200 volts, when measured with a high resistance voltmeter. The usual 20,000-ohm resistor in the oscillator anode circuit should be removed.

How To Improve Operation Of Converter Tubes

MIXER tubes usually are difficult to handle because so many undesirable effects are present at once. Two such effects are (a) difficulty in lining up and (b) low output at the high-frequency end of the high-frequency band.

Difficulty in lining up at 18 megacycles is caused by a number of complex phenomena, but a good remedy is to connect a fixed resistor of about 500 ohms in series with the grid lead to the tube (resistor R in the diagram). This value is not critical, and a small value is often more beneficial than a large one. Use the smallest value that gives satisfactory results.



Low sensitivity at the high frequency end of the high frequency band can be compensated by connecting a small capacitance from the grid of the oscillator section to the grid of the signal section, as shown by C in the diagram. This condenser should consist of two short lengths of wire about three inches long, twisted together. Tune in a signal at about 18 megacycles and start with a two-inch length of twisted wire. Clip off a little at a time until sensitivity is at a maximum.

MECHANIX ILLUSTRATED PHOTOGRAPHY

SECTION PAGES 107-116

2nd PRIZE

3rd PRIZE

4th PRIZE

FIRST PRIZE: "Suspicion" by W. D. Barkley, Baltimore, Md. Taken with 3¼x4¼ Graflex at f.22 and 1 sec. No. 10 flash bulb. S. S. Pan film. SECOND PRIZE: "Xmas Night" by Fern France, Hiawatha, Kan. Taken with 3¼x4¼ Graflex at f.6.3 and 1/10 sec. on S. S. Pan film. Two photofloods. THIRD PRIZE: "Acrobats" by E. A. Roberts, Middletown, Conn. Taken with 5x7 view camera on Super Plenachrome film at f.16 for 10 sec. Window lighting. FOURTH PRIZE: "Magic Carpet" by John T. Moore, Seneca, S. C. Taken with an Ica on S. S. Pan film at f.11 and 1/20 sec. with K-2 filter. (Two negatives superimposed.) FIFTH PRIZE: "Wash Day" by Charles A. Dean, Stockton, Calif. Taken with 1A Kodak on Verichrome film at f.11 and 1/25 sec.

MONEY FOR YOUR PICTURES!

Get busy with your camera and send in unusual pictures of people, animals, machines, trains, airplanes, etc. Each month we will pay $15 for the best picture received from readers, $10 for the second choice and $5 each for the next three selections. Prints should be glossy, as large as possible up to 8x10 inches (although a small, clear photo is more desirable than a big, fuzzy one) and should be accompanied by the following data: make and size of camera, type of film, and how developed and printed, lens opening and shutter speed, and lighting conditions. Wrap all prints carefully and include postage. Address contributions to Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York.

DRESS UP YOUR PRINTS

The novel mask used here was merely a negative made by photographing a sheet of corrugated paper of the type used for show-window dressing.

This border was made by photographing a cardboard portrait mount. Other materials, such as wallpaper, buckram book cover, etc., may also be used.

IF YOU want your pictures to stand out from the ordinary, here is an interesting and practical method of doing it. The "solon" type of photographer has used a variation of it for years, and so has the professional portrait maker. How is it done? *Dress up your prints!*

Masking offers the easiest and least-expensive method because with a paper or film mask or two, and nothing else, your contact or enlarged prints can be given the desired touch of individuality.

Quite likely you have been making your prints with an ordinary, square-cornered paper or metal mask, as has most everyone else. As a variation, use round corners. The black paper with which cut films are packed, if given a thin coat of shellac or varnish, is an excellent material from which to cut masks. A practical method is to cut a card-

Double printing masks, cut out of black paper as shown above, permit two pictures to be combined on a single large sheet of printing paper.

Simple paper "masks" lend decorative note to unmounted pictures.

by Kenneth Murray

Above: Masks for enlarging should be attached to sheets of clear glass, which are then placed over the enlarging paper on the easel. Above, right: This simple but effective masking arrangement was adapted from the method used to decorate newspaper halftones. Narrow strips of gummed red paper were attached near the edges of a sheet of glass, which was used under the negative.

board template on your paper trimmer, lay it on the black paper and use it as a guide

Above: The border for this picture is merely a negative made by photographing a small wooden picture frame. Right: When used for contact printing, the paper mask is simply placed over the negative.

A concave chisel can be used for cutting masks having round-cornered openings.

in cutting with the corner of a *sharp* razor blade. The round corners are made with a concave wood chisel; a sharp tap with a mallet is all that is necessary.

Some masks are made of thick paper, cardboard or colored celluloid, and consequently they prevent absolute contact at the edges. The results are fuzzy. To make an extremely thin mask, cut a paper template, attach it to a sheet of thin glass with rubber cement, then coat or spray the border of the glass with thin black or red varnish. When this is dry the paper template can be pulled away to leave a sharply-outlined opening that will not prevent the edges of your pictures from being sharp. Use the masking glass underneath the negative.

When you enlarge your negatives, the mask shown in the lower right corner of this page is excellent to use. It has a small cellophane-covered window marked with black India-ink lines which are easily focused sharply on the easel. You will appreciate it particularly when working with dense negatives!

A number of decorative effects which replace the ordinary white borders, for snapshots or anything larger, can be seen in the illustrations. In most cases the borders are printed in from another negative. The latter are made by photographing unusual textures, such as corrugated cardboard, coarse cloth, the buckram binding of a large book and similar materials. You can also make a negative of a wood picture frame or portrait mount.

[*Continued on page* 121]

Below: Air-brushing a mask on a sheet of glass. Such masks are very thin and prints made with them will have sharp edges. Right: An additional cellophane window, with inked cross lines, makes it easy to focus sharply when enlarging. This mask is used next to the negative.

Copying With the Enlarger

by Richard Burnett

MANY amateur photographers at one time or another have occasion to make a copy of some photograph or article of which the negative has been lost. Perhaps some friend has a picture that he wants copied and would gladly pay to have you do the work for him.

Copy work cannot be done with most hand cameras, but you can make a temporary copying camera out of the average enlarger. The cost is practically nothing and you can turn out very satisfactory copies of almost anything you might come in contact with.

I use a standard 5x7-inch enlarger, as shown in the illustration, using the lens from my camera. Naturally a few changes have to be made in the enlarger in order to convert it into a copy camera.

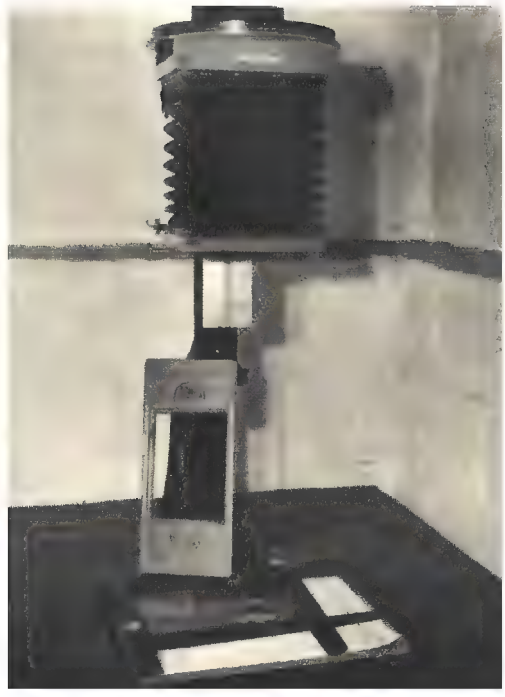
The first step is to remove the lamp house from the enlarger. (Top photo). Then take out the ground glass or opal glass which is used in the enlarger for diffusing the light. You must also remove the negative carrier. Now you are ready to proceed.

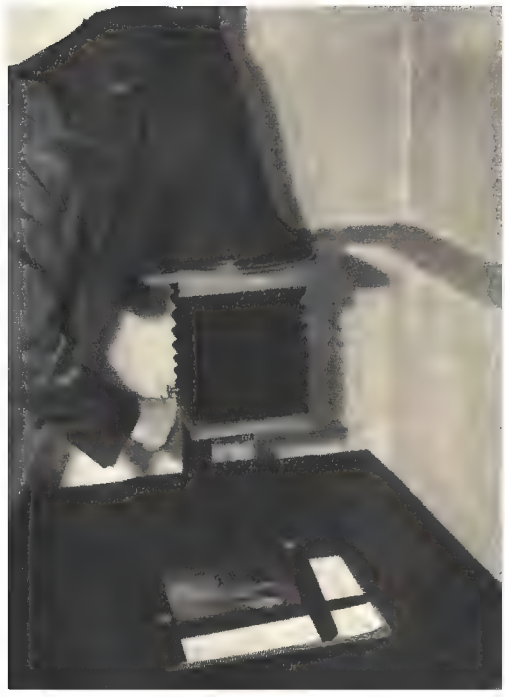
Take out the glass which holds the film in the negative carrier and substitute for it a piece of ground glass, which can be purchased for a nominal sum. If you wish to make your own ground glass you can do so easily by grinding the glass with ordinary valve grinding compound, which can be bought in any automobile supply store. Just put some of the compound on the glass and, using another piece of glass, rub vigorously. Wash the glass with water. If it is not dense enough repeat the process. Place the ground glass in the negative carrier and put the carrier back in the enlarger.

You are now ready to focus. Place the picture to be copied on your easel and proceed to focus, as shown in the lower illustration. Focusing is done the same as it is with any camera with a ground glass back, by using the rack and pinion on the side of the enlarger. To get the right size you raise or lower the enlarger until the image fills the ground glass. The enlarger is locked to the correct focus and again the negative carrier is taken out. The lamp house is now replaced. to prevent stray light from striking the negative carrier.

For lighting I use four 75-watt lights in reflectors, which are placed two on each side of the object to be copied. For most work

[*Continued on page* 121]





HINTS

Clippers Round Print Corners

A NAIL clipper may be used to considerable advantage in photographic work, particularly in rounding the corners of negatives and prints. Clipping the sharp corners of negatives eliminates the possibility of scratching the emulsion when films are stored in a box.

Sharp Shadows With Photoflood Lamps

AN EXCELLENT way to obtain raw, undiffused light for special effects is to make a "window" on photoflood lamps that have outside frosting. Such a lamp can be made to cast a clear shadow by spreading a thin film of glycerine or sodium silicate over the lower part of the bulb. Either liquid temporarily hides the frosting. It is easily wiped off later.

"C" Clamp Holds Floodlight Lamps

A 10-CENT "C" clamp substituted for the regular spring clamp on portable floodlights serves as an excellent grip. Soft rubber washer between jaws of clamp prevent damage to chairs and woodwork. Some clamps require filing a notch in center.

Negative Pencils

THE so-called "negative" pencil is a grease pencil available from art supply stores and is useful for writing on smooth surfaces, bottles, prints and labels. It shows up very clearly on surfaces that will not "take" markings from ordinary lead.

Lens Filter Strap Attaches To Wrist

RIVET several wood discs to a leather strap that fits about the wrist. Lens filters may be slipped on these discs to facilitate their handling.

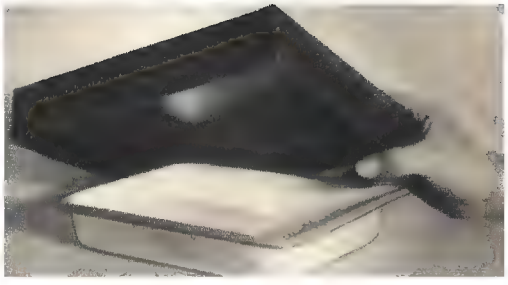
FOR CAMERA FANS

Keeping Negatives Cool

A GOOD way to protect negatives by dissipating heat generated by the lamp housing is to cut a negative mask of sheet copper long enough to project several inches from each side of the enlarger. It should be painted a dead black.

Increasing Angle Of Spotlight

BY ADDING a bent steel or brass rod between the lamp and upper part of a reflector stand, it is possible to increase the angle at which a spotlight or reflector may be tilted.



Cover For Developing Tray

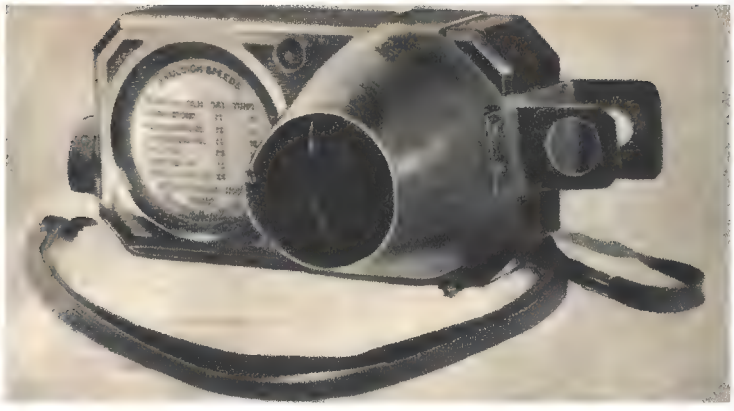
A COVER made of cardboard or sheet metal, painted a flat black and which may be slipped over a developing or fixing tray, serves as an excellent safeguard against fogging.

Iodine Removes Black Spots

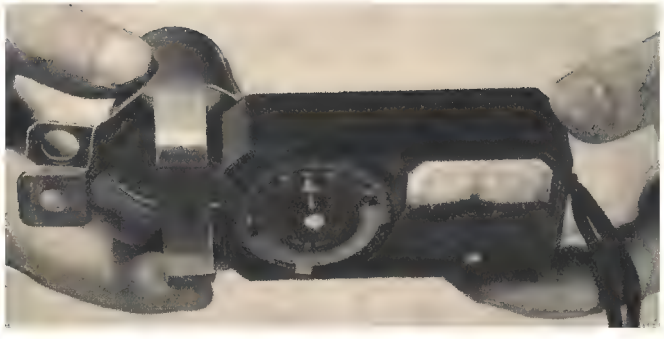
ORDINARY tincture of iodine will remove black spots from prints that are due to pin holes. Apply the chemical with a swab of cotton on the end of a tooth pick. Then refix the print in plain hypo. The spot may now appear too white but a little spotting with a soft pencil will correct it.

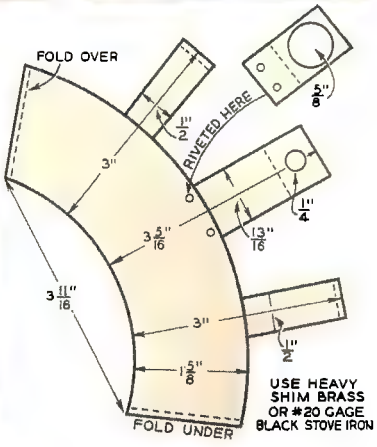
Wire Tripod Brace

THREE strips of stiff wire cut from clothes hangers serve as excellent tripod braces. Drill facing holes in the tripod legs, push the wires through and bend one end. The wires will hold in place through their own springiness.



Above: Front view of the sight attached to a Weston exposure meter. Above, right: The meter is held in the usual manner, but the sight confines the size of the area from which the reading is taken.





Above: The device slides over the left end of the meter case. Right: Template for the sight. Brass or aluminum is suitable.

SIGHT FOR ELECTRIC PHOTOMETER

THE correct and accurate way to use an electric exposure meter is to measure the light reflected from only the subject and not that from the background, foreground or sky. Light reflected from the sky is particularly troublesome as it is liable to cause a high meter reading.

Often enough it is not possible to make a close meter reading of a distant or inaccessible subject, but accuracy can be secured with the use of the simple meter sight illustrated here. The particular model was designed for the standard Weston meter, but one can be made, with slight alterations, to fit a meter of any type.

The device can be slipped on or off the meter in an instant. It confines the view of the photometer cell to a definite area which is identical with that seen through two sighting holes. Readings of subjects near the horizon can be taken without fear that light from the sky will upset calculations. Likewise, readings of well-lighted subjects will not be disturbed by a darker foreground.

The meter is held in the usual manner and about 5 inches from the eyes. Locate the subject in the sight, then note the reading. The light opening of the device reduces the field and amount of light reaching the cell exactly half, therefore all readings are to be doubled to arrive at the correct exposure.

It is important that the inside of the cone be painted a dead black. Line up the sights by pointing the device at a definite object, note how much area can be seen through the cone opening and adjust the sights to take in the same view. Face the meter to the sky and take readings with and without the device in place. The latter reading should be just twice as great as the former.

BARGAINS IN BOOKS AND BLUEPRINTS

These splendid, 144-page MECHANIX ILLUSTRATED books will help you get the maximum pleasure and benefit from your hobby, workshop or sport. They are sent post paid at the amazingly low price of 50 cents each. Use coupon below for ordering.

HOW TO BUILD 20 BOATS

Complete, detailed plans and construction details for easy-to-build boats ranging in size from 7 to 27 feet. Also a wealth of information on upkeep and repair, plus full instructions for reconditioning, navigation and easy-to-make accessories. 144 Pages 50c

SPORTSMEN'S ANNUAL

A handy, illustrated encyclopedia of facts and information for all who enjoy the great outdoors. Contains a multitude of handikinks for hunters, new angles for anglers, and invaluable ideas for all campers, woodsmen and sportsmen. 144 Pages 50c

HANDY MAN'S HOME MANUAL

This book repays its cost many times over by telling you how to make a multitude of repairs and improvements around the house without the aid of outside help. Full of easy, practical how-to-make, how-to-repair, and how-to-improve kinks. 144 Pages 50c

HOW TO BUILD IT

Whether your workshop is large or small, this book will supply you with endless projects on which to exercise your skill with tools. Complete, detailed plans for building midget auto racers, model planes and locomotives, playground equipment, etc. 144 Pages 50c

HOW TO BUILD TRAILERS

This book brings the joy and luxury of a trailer within the reach of all. Complete construction details for building seven different cabin trailers, two boat trailers, delivery trailers and many trailer kinks at a fraction of the usual expense. 144 Pages 50c

PHOTOGRAPHY HANDBOOK

Everything you need to know to improve your camera and darkroom technique within the covers of one expertly edited and lavishly illustrated book. How to develop, print and enlarge films; how to make your own darkroom equipment; how to take better pictures, etc. 144 Pages 50c

FREE! A copy of the MECHANIX ILLUSTRATED Blueprint Catalog will be sent to you free upon receipt of a three-cent stamp to cover mailing. The catalog lists all available MECHANIX ILLUSTRATED blueprints and many technical and hobby books.

CUT OUT AND MAIL TODAY!

FAWCETT PUBLICATIONS, INC. MI-3
Fawcett Building
Greenwich, Conn.

Enclosed find money order, check or stamps. Please send me, postpaid, the book(s) I have checked below:

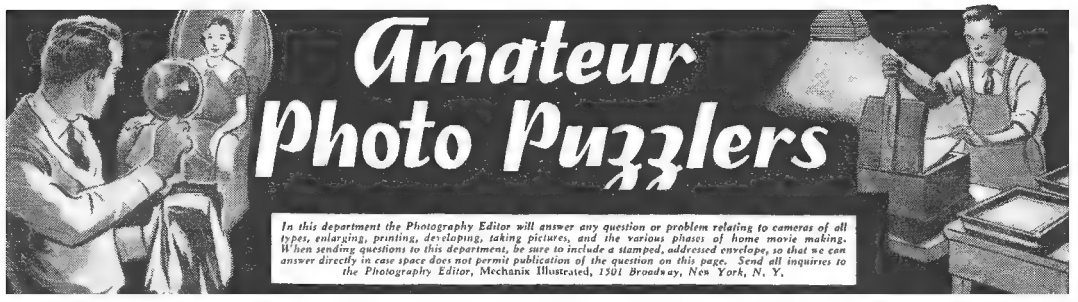
☐ HOW TO BUILD 20 BOATS ☐ HOW TO BUILD IT
☐ SPORTSMEN'S ANNUAL ☐ HOW TO BUILD TRAILERS
☐ HANDYMAN'S HOME MANUAL ☐ PHOTOGRAPHY HANDBOOK

I enclose 3 cents postage for free Blueprint Catalog.

Name .....
Address .....
City ..... State .....

FAWCETT PUBLICATIONS, INC.

FAWCETT BLDG., GREENWICH, CONN.


Amateur
Photo Puzzlers
In this department the Photography Editor will answer any question or problem relating to cameras of all types, enlarging, printing, developing, taking pictures, and the various phases of home movie making. When sending questions to this department, be sure to include a stamped, addressed envelope, so that we can answer directly in case space does not permit publication of the question on this page. Send all inquiries to the Photography Editor, Mechanix Illustrated, 1501 Broadway, New York, N. Y.

PRINTS STICK TO FERRO-PLATES

My prints stick to ferrotyping plates so that they tear when I remove them. Why is this?—Parker Smilie, Montgomery, Ala.

Prints usually stick to ferrotyping plates because the plates are not clean or because the prints have not been sufficiently washed in running water after processing. To correct this difficulty, use a full-strength hypo for fixing and wash prints at least 30 minutes in running water. Stir the prints occasionally during washing. Clean the ferrotyping plates with soap and water before using and repeat this washing of the plates after each set of prints have been ferrotyped and before the next ones are put on. It is also advisable to dip the plates in very hot water just before the prints are applied. Take care that no abrasives are in the soap when washing the plates, or the plates may become scratched.

NEGATIVE REDUCTION

I over-developed several negatives. What can I do to correct them?—F. A. Honkanen, Ironwood, Mich.

Over-developed or over-exposed negatives may be corrected by the "reduction" process. In the case of over-exposures, the negative appears flat and foggy without contrast because of existence of too much silver metal. In the case of over-development, the negative will appear too contrasty. To adjust these negatives for satisfactory printing, some of the silver image must be removed without injuring the negative. Probably the type reducer most desirable for over-developed negatives is the super-proportional or flattening reducer. This type acts first on the denser parts of the silver image, especially where the highlights are too opaque for printing. Ammonium Persulphate is the only chemical known which has the peculiar property of attacking the denser parts of the silver image without destroying the shadow details to any extent. This chemical is prepared by adding 2 to 3 drops of chemically pure sulphuric acid to every 3½ ounces of a 2 per cent solution of Ammonium Persulphate. Be sure the negative is well fixed and then immerse it in this solution. Observe the action carefully as it easily goes too far, attacking the shadows as well as the highlights. Remove the negative quickly when the grade of density seems satisfactory and place it immediately in a 5 per cent solution of sodium sulphite to stop reduction action. Then wash as usual.

SATURATED BROMIDE SOLUTION

What method assures a correct saturated solution of potassium bromide?—P. H. Dantz, Denver, Colo.

A great possibility of error can occur in formulas that call for a saturated stock solution of potassium bromide, because the quantity used depends entirely upon the weather. More can be dissolved at high temperatures than at low temperatures. This means that the strength of the solution changes with the weather because more and more potassium bromide will precipitate out as the weather gets cooler. This source of error may be eliminated by preparing a 10 per cent stock solution by taking one ounce of potassium bromide and dissolving it in enough water to make 10 ounces in all. A 10 per cent solution does not contain enough potassium bromide to have it affected by changes in temperature, so that its strength is always the same. The following proportions should be used: 10 drops equal 1 grain of potassium bromide.

GLAZING PRINTS ON GLASS

What is the method for glazing prints on glass?—C. H. Clifford, Darien, Conn.

Prints with a gelatin surface may be squeegeed on glass for a gloss finish. The glass should be free from blemishes and cleaned in hot water with the addition of a little washing soda. After rinsing in clear water, polish with a duster and a mixture of a 10 per cent solution of ammonia and methylated spirit in equal parts. When thoroughly clean and dry, dust a little French chalk over the surface and then wipe off lightly. There are other preparations which may also be used, and anything of a slightly greasy nature that will prevent the prints from sticking to the glass, is usually satisfactory. A coating of paste wax (unadulterated with quick-drying qualities) may also be used when applied in a thin coat and spread evenly. Polishing the glass with a soft cloth saturated in paraffin will also do the trick.

PRINTING ON SILK

What is the process for printing on silk?—C. Becker, Brooklyn, N. Y.

Several photographic processes are applicable to silk and other textiles. Generally a coat of gelatin used as a sizing agent is often applied first. The following coating may be applied to silk, linen, muslin or canvas.: 10 ounces of water, 100 grains of common salt and 20 grains of gelatin. Dissolve this mixture under heat and uniformly moisten the textile with it. Be sure to stretch the textile on a frame. When textile is dry, moisten it again with a solution of silver nitrate, 40 grains to the ounce. The material being once more dried, is ready for printing.

DEPTH OF FOCUS

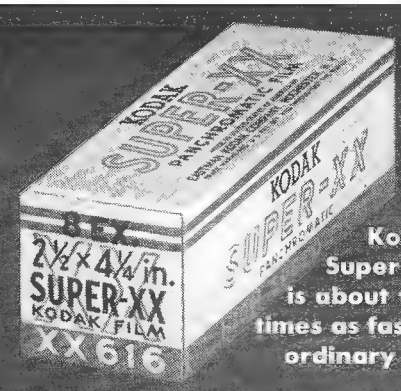
What is meant by depth of focus?—David Carpenter, Bridgewater, Ark.

Depth of focus refers to that part of a picture which is sharp and includes the field bounded by the point in the foreground nearest to the lens that is sharp and by the point farthest from the lens that is also sharp. These two extreme points of sharpness indicate the depth of focus which increases as the diaphragm is made small and decreases as the lens diaphragm is made large.

MECHANIX ILLUSTRATED AWARDS $40 EACH MONTH FOR BEST PHOTOS SUBMITTED BY READERS

The editors of MECHANIX ILLUSTRATED distribute $40 in cash awards each month to the five persons who, in their opinion, submit the best pictures suitable for publication in the MECHANIX ILLUSTRATED Photography section. Full particulars regarding these awards will be found in this issue on page 107.

EASTMAN'S NEW HIGH SPEED FILM



Kodak Super-XX is about four times as fast as ordinary film

MAKES NIGHT SNAPSHOTS EVERYBODY'S HOBBY

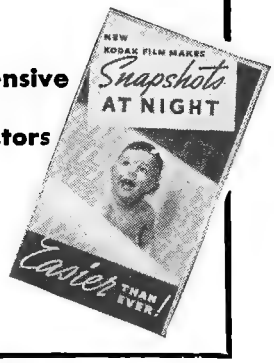
NIGHTTIME SNAPSHOTS are sure shots, now. You use any camera that takes the new high speed film, even an inexpensive Brownie—Kodak Super-XX is now available in all standard amateur sizes. You get snaps that have the spontaneous, delightfully lifelike quality of outdoor pictures. And the shooting itself is almost as simple. With Kodak Super-XX, you use two or three inexpensive Photoflood lamps in Kodak Handy Reflectors.

ALL YOU NEED

Your present camera loaded with the new Kodak Super-XX Film

plus

two or three inexpensive Photoflood lamps in Kodak Handy Reflectors



FREE BOOKLET... Condensed course in indoor snapshooting. Detailed, easy-to-understand instructions, interesting photographs, clear-cut diagrams show you how to arrange your lights and place your subjects—how to make your very first batch of indoor snapshots as good as any you'd take outdoors. Get a copy at your dealer's . . . Eastman Kodak Company, Rochester, N. Y.

Thrills And Spills With Racers

[*Continued from page 40*]

Bob Meyers is another driver who uses springs and no axle on the front-end so that the wheels pitch, but his engine is an outboard that costs $225. Cost is an important element in equipping midget racers. A J.A.P. costs over $600 and is considered by many as the ideal motor because of its performance and the fact that it will hold up. When in good condition, this motor is good for 15 races whereas an outboard has to be torn down and rebuilt every three to five races.

The V8 is considered by some drivers as "too much iron" but there's a V8 in practically every race. It can be geared to do over 100 miles an hour and rebuilt for half the cost of other engines. There's no end to the midget racer's imagination when it comes to converting an engine—any engine—for his kiddy-car. Harold Bjanes took a Continental engine designed for industrial use in tractors and commercial power plants and made a racing engine of it by changing the gear ratio, increasing the compression and raising the horsepower from 35 to 45 at 5500 rpm.

The question of when is a midget not a midget is answered by the general specifications adhered to by all midget racing groups. Weight limits are between 500 and 950 pounds. Wheelbases are between 70 and 76 inches, tread is 42 to 46 inches and height is 36 inches from ground to top of cowling. Superchargers may be used on 2-cycle engines of 50 cu. in. displacement. Non-supercharged motors generally have a displacement of 61½ cu. in. and not over 85 cu. in. and are equipped with two or more carburetors.

Average car weight is 750 to 850 pounds (if they get too light they bounce around) and in order to keep them at that weight, the drivers have to do some weird things. It's hard to keep the weight down in 2-cycle, 4-cylinder engines. Most of the time the driver needs every ounce of power and they drive with the throttle down to the floor. "We open up everything but the doors," say the drivers, "and we would open those too, if we had any!" Drivers who purchase the high-powered Offenhausers usually figure on pruning down weight to even things up.

Pete Naccarato, whose driverless car won a race for him, substituted the rear-end from an old model-T Ford with a lighter driveshaft housing to eliminate weight. He also took out the radius rods and put in others of dural airplane tubing. An aluminum clutch replaced the iron one and more weight came off. Finally he tore down the spring assembly and rebuilt it as a cross-spring assembly with one in front and one in the rear. He added tail guards to keep other racers from climbing aboard and wheel guards as safety arms in front of the rear wheels to keep from locking arms with another racer.

Reducing weight, however, can be carried too far, as Pete found out. One of his earlier light racers struck a dip in the track and before the

[*Continued on page 120*]

Combination Rack And Tray

[*Continued from page 98*]

up the top of the second mound, set it over the end of a ⅝" round iron bar and hammer the top of the mound down flat.

The pipe holder is cut from the same material. It is hammered and the sides are rolled up while the piece is straight. Then place the piece on a lead block, and placing the ball of one hammer where the bend is to be made, drive it down with a second hammer. Drill a hole in the center of the bend in the rack, and one in the center of the mound, and rivet the pipe holder in place.

To finish, coat the piece evenly with copper nitrate solution and heat with a blow torch until it turns green, then brown. Dust off, and if it is not dark enough, repeat the operation. Burnish the highlights with fine emery paper and wax with ordinary floor wax, and polish. The finish is very durable and is not affected by heat from a pipe or by hot ashes.

After the piece is all finished, drill a hole in the center of the other mound, set a cork on the mound and fasten from the under side with a round head wood screw. Paint the sides of the cork with black lacquer.

The pipe rack will always keep the pipe right side up and prevent the spilling of ashes, and the cork becomes a good place to knock the ashes from the pipe.

New Uses For Old Shoes

[*Continued from page 86*]

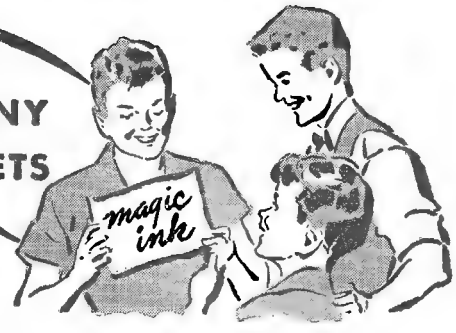
fine a thong as possible. Figure 7 illustrates the routine of lacing.

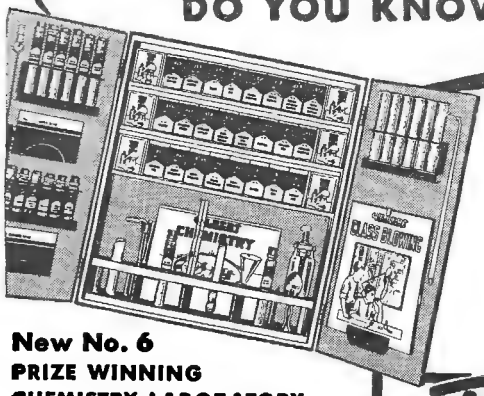
Two types of lanyards are shown in Figs. 5 and 6. One is square, and one is diamond-plaited round, the latter being smaller and more flexible. This type of plaiting can be used for making watch fobs, hatbands, bridles and whips.

A simple project for the beginner is a coin or stamp purse as shown in Fig. 8. Cut as large a rectangular piece as possible, or, if a large enough piece cannot be cut, then make the purse with two pieces, or even three, lacing them together along the edge of the purse. Cut two slots in one end and cut a tongue on the other, to serve as a fastening for the purse. If you prefer, snap fasteners may be put on instead of the tongue and slots. Snap fasteners and the simple tools for attaching them may be purchased at leather goods stores or through dealers in handicraft materials. Punch the edges with an awl for lacing. Tool a monogram or design on the back. It will facilitate the lacing if you will first fasten together the edges to be laced, using rubber cement. Open each hole with an awl as you go. Be careful not to draw the thong too tight, because it would cause the edges to curl.

The craters on the moon are mountains in ring form, 50 to 60 miles in diameter.

Boys! HOW MANY OF THESE CHEMICAL SECRETS DO YOU KNOW?





Do you know the secret of writing messages in magic ink, of making a chemical weather flag, changing the colors of flowers, making your own paints, sparklers, soda water? All these and many other thrills can be yours with a Gilbert Chemistry Set—the set that has been developed in the Gilbert Hall of Science. Also—the new Gilbert Microscope reveals to you Nature's innermost secrets.

$200.00 Annual Awards—To the boy doing what, in the opinion of Mr. A. C. Gilbert, is the most important research in Chemistry, Microscopy or Electricity in 1939, $100.00 in cash will be awarded. To the ten boys doing the next most important research, $10.00 each will be awarded. Mail coupon below for free 20-page book giving full details.

New No. 6
PRIZE WINNING CHEMISTRY LABORATORY

Big blue wooden cabinet forms Laboratory over 2 ft. long with 5 feet of test tube racks and shelf room. 63 chemicals and pieces of apparatus, including glass blowing equipment, 2 books by noted Yale professors describing over 400 exciting experiments. Price $5.00. Other Gilbert Chemistry Sets $1.00 to $15.00. See them at your nearest toy store.

Free BIG BOOK "FUN WITH GILBERT TOYS"

20 pages crammed with color pictures of new Gilbert Chemistry Sets and latest developments of Gilbert Hall of Science. Mail coupon or 1¢ post card.

THE A. C. GILBERT CO., Gilbert Hall of Science, Room 105, New Haven, Conn.

Name.....
Street.....
City.....State.....

You'll Earn $150 TO $300 EXTRA PROFITS MONTHLY with 40 VOLT "Simplified" ARC WELDING

FREE BOOK on "Profits for Welding Shops"

"BUILD YOUR OWN" SAVE $300 to $500

Use your own engine and chassis with this unit, get advantages of portable welder that lets you go to the big pay jobs.

Start big paying business of your own now, with new 40 Volt Simplified Arc Welder. Faster, simpler, easier to operate. Practically no investment . . . extra profits pay for it without expense to you.

30 DAYS TRIAL! on your own work, at our risk, to prove it's profitable. Write today to

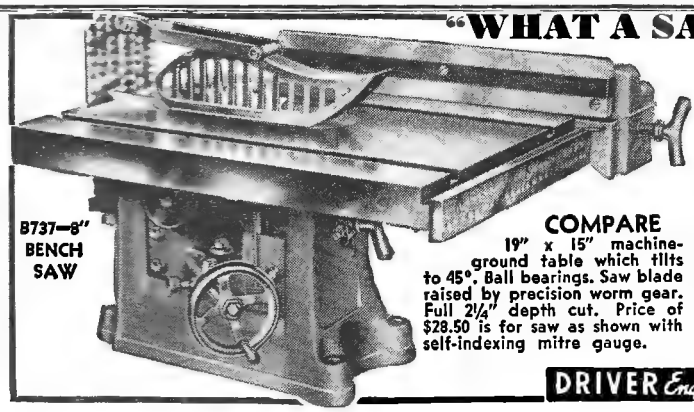
HOBART BROS., Box SM-1281 TROY, O.

ONLY $20 MONTHLY Puts it in your shop

HOME WORKSHOP FANS

Get full advantage from your shop by building that project you have long had in mind. No doubt you'll find it explained fully in the 1938 HOW-TO-BUILD-IT book which contains plans for making midget racers, auto trailers, furniture, radios, games and toys. Send your 50c now for this big 144-page book—contains 500 pictures and plans all in rotogravure.

Fawcett Bldg. FAWCETT PUBLICATIONS, Inc. Greenwich, Conn.



B737—8" BENCH SAW

"WHAT A SAW FOR ONLY $28.50!"

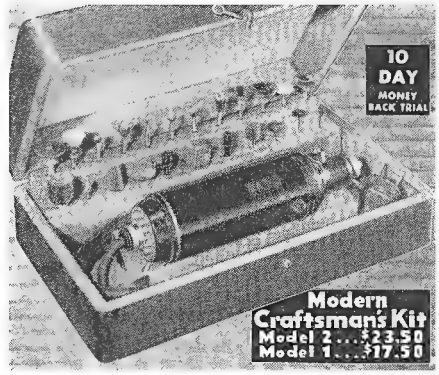
That's what you'll say . . . every man does, when he sees this Walker-Turner 8" Bench Saw. It was built to offer BIG value. Examine it at your local dealer's store. Its construction features and exceptional range of usefulness will surprise you. More about it in the NEW 1939 DRIVER CATALOG. For your copy, write to Walker-Turner Co., Inc., 5128 South Ave., Plainfield, N. J.

COMPARE

19" x 15" machine-ground table which tilts to 45°. Ball bearings. Saw blade raised by precision worm gear. Full 2¼" depth cut. Price of $28.50 is for saw as shown with self-indexing mitre gauge.

DRIVER *Engineered* POWER TOOLS

for a *Merry Christmas* and a HOBBY NEW YEAR



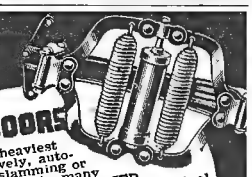
All-Purpose MOTO-TOOL

Moto-Tool makes an attractive, practical gift every craftsman will appreciate — for no other motor-in-hand tool in its class matches Moto-Tool in speed, power, ease of handling or in exclusive construction advantages that provide, long trouble-free service. Moto-Tool does in seconds jobs that require hours of hard hand work. Handles all accessories, works on all materials, runs on A. C. or D. C. Absolutely safe. Thousands in use. Model 1, 6 oz. 25,000 r. p. m., for light work. Model 2, more powerful, 13 oz. about 27,000 r. p. m. $16.50 postpaid. At leading dealers — or order by mail on money-back trial. Write for free illustrated booklet.

Dremel Mfg. Co. 1036 CT., Racine, Wis.

America's Exclusive Maker of Motor-in-Hand Tools

STOP THAT SLAM!



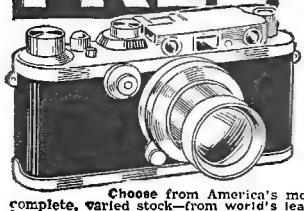
AMAZING INVENTION STOPS SLAMMING DOORS

KANT-SLAM closes heaviest doors silently, positively, automatically. Prevents slamming or leaving doors open. Lasts many years. Easily installed. LOW PRICED. Demonstrator Furnished. We supply actual Real KANT-SLAM on easily-carried miniature door. You make big money on quick sales to stores, offices, factories—every building can use 1 to 20! Free Demonstrator to workers. Write! Get free details.

PAYS BIG PROFITS DAILY!

KANT-SLAM CO., Dept. F-54, Bloomfield, Ind.

FREE CAMERA BOOK!



Offers hundreds of money-saving bargains in Still and Movie Cameras, Lenses, Films, Enlargers, Exposure Meters, Darkroom Supplies—everything photographic.

Choose from America's most complete, varied stock—from world's leading makers: Eastman, Zeiss, Bell & Howell, Graflex, Korona, Bausch & Lomb, etc. 10 Days Trial—Satisfaction Guaranteed. (Your camera, equipment taken in trade.) Write for Free Camera Catalog NOW!

CENTRAL Camera Co. (Est. 1899)
230 S. Wabash, Dept. J-12, CHICAGO

Build The MI "Sky Flea"

[*Continued from page* 89]

given to the wing by cementing the two halves together while holding the one half flat and raising the other until its tip is two inches above the table (see sketch). Allow this union of wing halves to dry thoroughly before completing the model. Cement a small section of two thicknesses of wrapping paper to the trailing edge of the wing at the center to provide the necessary angle of incidence when the wing is attached to the motor stick.

The tail surfaces—rudders and stabilizer—are slotted so that they can be interlocked, providing a fairly rigid support for the rudders. Cement the rudders and stabilizer together at the points where the slots make contact. The wing and the tail unit are held to the motor stick by means of looped rubber bands, making contact with the underside of the stick.

Before winding up the rubber strand motor, test your model by hand-launching it, permitting it to glide through the air. If it has a tendency to climb and stall, move the wing backward. If it dives, move the wing forward. Having made the necessary adjustments, wind the rubber strands until the second row of knots appears and launch it.

Thrills And Spills With Racers

[*Continued from page* 118]

driver knew it he was sailing through the air, slipping out of his safety belt and landing wrong side up on the track. That was one time a crash helmet served him a good turn. Crash helmets are now a rule of the tracks. Harry Lewis is living today because he was wearing a helmet when he was thrown from his racer and landed on his head. The helmet was split open and Lewis was stunned but at least his head remained whole.

The spectators who turn out to see some thrills, and that means spills, like to see the midgets flip over. That makes it tough on the drivers, but it's all part of the game. As a matter of fact, the good driver can take a flip by ducking from side to side as the car rolls over. There's no room inside of the midget for the driver to crouch so the sides of the body are cut low, permitting the driver to lean over far.

When the races start the cars seem to bounce and bump about like a school of scatter-brained ants. The racers swing quickly into a dangerous snarl and crawl around the track with engines spitting and stalling, roaring and smoking. The cars scrape wheels and nudge one another as drivers jocky for position. Sometimes one driver will hold back half a lap and the boys in-the-know say that it is a purposeful maneuver designed to load up the outboards which can't stand the slow pace because their carburetors become

[*Continued on page* 128]

Copying With Enlarger

[*Continued from page* 111]

the lights should be placed at an angle of 45 degrees or until the object is free from reflections. You will have to experiment at first for the exposure. For copying pictures the exposure usually runs between 12 and 20 seconds, depending on how dark the print to be copied is, and, of course, the distance between the lens and the easel. These exposures are for "commercial" cut film. If I have to copy colored prints I use panchromatic, which is three times faster. Of course, pan film must be handled in complete darkness; orthochromatic film can be used under a red safelight.

Next take the ground glass out of the negative carrier and replace the original glass, inserting a piece of film in the carrier, emulsion side down. Place several thicknesses of black paper over the film so that no fogging occurs. Now place the carrier back in the enlarger. As the film is in the exact location that the ground glass was, it will be in perfect focus. Stop down to f.16 and make your exposure. If you have a lens cap you can turn on your lights and make the exposure by taking the lens cap off and replacing it when the exposure is over.

If you find that the film is getting light struck you will have to shield the negative carrier from the lights. I use two pieces of cardboard which I wedge between the carrier and the enlarger. This has worked very satisfactorily.

Dress Up Your Prints

[*Continued from page* 110]

With the double-printing method, cut a sheet of masking paper to the size of your printing paper. Next make a cardboard template or guide to the size of the picture desired. Center it on the mask and cut around with a razor blade. The outside part is used to protect the printing paper while the picture negative is being exposed. The inside portion may be attached to a sheet of glass, of the same size as the printing paper, to protect the picture opening while printing the border from another negative.

Single printing can be done by using the border negative as a mask, cutting away the opening for the picture. The edge of the opening must be blocked out for about ⅛-inch to conceal the edges of the picture negative.

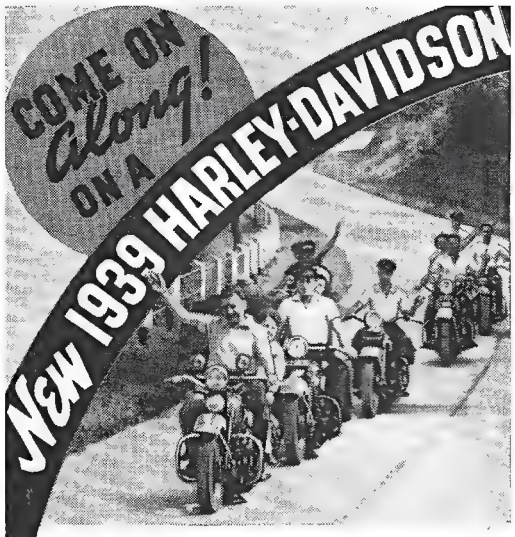
Build "Ice-Sprite"

[*Continued from page* 92]

to a machine shop where it can be done expertly and economically. The 45-degree bevelled cutting edges should be filed and honed to produce fast blades.

Make the front hobblers of angle iron as shown

[*Continued on page* 127]



Make 1939 Your Biggest Fun Year!

You can pack the whole year with new thrills, pleasures and great adventures—when you own a new 1939 Harley-Davidson. Make more friends — enjoy the country's finest scenery and most popular fun spots with other happy riders. It's a hobby you really can ride — on a mount that's unmatched for zooming power, easy riding and smart styling.

Get into motorcycling — world's greatest outdoor sport—and ride a Harley-Davidson, World's Champion Motorcycle. See the Harley-Davidson dealer — inspect the new 1939 models with their improved performance—still lower upkeep—super-streamlined design — classy appearance and striking color combinations. Ask about his Easy Pay Plans — and mail the coupon NOW!

WINS "JACK PINE" AGAIN! **For the 14th consecutive year, Harley-Davidson wins this premier National Endurance Championship!**

Harley-Davidson
WORLD'S CHAMPION MOTORCYCLE

MAIL THIS COUPON NOW

HARLEY-DAVIDSON MOTOR COMPANY
Dept. M1-1238, Milwaukee, Wis.
Send illustrated literature and FREE copy of "ENTHUSIAST," Motorcycling Magazine. Stamp is enclosed for mailing cost.

Name_____

Address_____

Earn BIG MONEY MAKING ELECTRIC RAZORS at home!

BUY ALL PARTS READY FOR INSTANT ASSEMBLY
NO TOOLS NEEDED
Make $5 or More on Every Razor Sold

Just think, a complete $15 type razor for $1.66 or less. You can make $5 or more for fifteen minutes of your spare time. Start AT ONCE, big or small—with one unit or 100—make your own electric razor or sell to others—you can profit both ways!

Costs $1.66 in lots of 3
SAMPLES $1.95 EACH

Make your own electric razor just like the ones selling in the high price brackets. Earn money in your spare time or full time. Buy parts from us . . . assembling complete matched units. Every part standardized precision-built made by us ready to be put together to make one of the most popular standard super-quality Electric Razors. (The same high quality parts now used in Shavers selling for much higher prices.) Write for information or order your first unit at once and prove the money-making possibilities to your own satisfaction.

SIMMONS MFG. CO.
104 W. North Ave., Chicago

FREE
Screwdriver and instructions with order for first unit. You need no other tools . . . no soldering equipment.

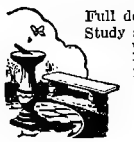
SIMMONS MFG. CO.
104 W. North Ave., Chicago

☐ Send C.O.D. 1 sample razor kit for which I will pay postman $1.95 plus a few cents postage.
☐ Enclosed find $_____for_____Electric Dry Shaver Kits including free instruction, tools and money making plans.

Name _____

Address _____

SUCCEED IN LANDSCAPING
Send for FREE Book on Landscape Training



Full details about this profitable career for men or women. Study at home in leisure time. Successful graduates receive large fees. Students earn $5, $10, $15 a week while learning. Field uncrowded; initiative rewarded. Write today, giving age and occupation.

AMERICAN LANDSCAPE SCHOOL
6021 Grand Ave. Des Moines, Ia.

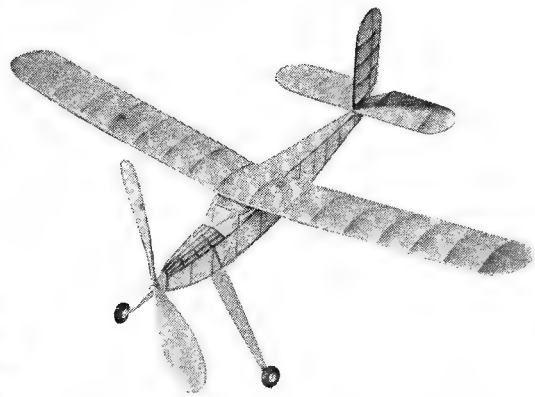
NOW ONLY $5.00

REAL ENGINE VALUE
Over 7,000 GHQ Gas Engine Kits have been sold at $8.50. Now is your chance to buy the *New Improved* kit for $5.00. Absolutely complete with coil, plug, etc. Send only $1. Shipped Exp. Coll. for balance same day. Catalog 5c. DEALERS WRITE.

A SCREW DRIVER IS THE ONLY TOOL NEEDED.
AVERAGE ASSEMBLY TIME 30 MINUTES.
GHQ MOTORS, 854A East 149 St., New York, N. Y.

"Men With Wings" Contest

[*Continued from page* 80]



A kit of parts for constructing this rubber-powered Air-King endurance model will be awarded as 16th prize.

Eighth, ninth and tenth prizes are complete kits (less engines) for constructing "Maxwell Bassett," "Flying Quaker" and "Quaker Flash" gas-powered model airplanes, respectively. These three kits were donated by Megow's of Philadelphia, Pa.

The eleventh and twelfth prizes consist of complete kits of machined parts for assembling G.H.Q. miniature gasoline engines, which were donated by G. H. Q. Motors, Inc., of New York, N. Y.

Thirteenth prize is a complete kit of parts (less engine) for constructing a Bay Ridge "Mike" gas-powered model airplane donated by the Bay Ridge Model Airplane & Supply Co., of Brooklyn, N. Y.

Fourteenth prize consists of a Brown, Jr., Model D miniature gasoline engine, completely assembled and including a streamlined exhaust manifold, a Polk's Perfect-Pitch propeller with a solid aluminum spinner. This motor, with accessories, was donated by Polk's Hobbies Shop of New York, N. Y.

Fifteenth prize is a construction kit for building a Silver Streak rubber-powered model airplane, donated by the Country Club Aero Supply Co., of Kansas City, Mo.

Sixteenth prize is a kit of parts for constructing a rubber-powered Cabin Endurance model plane, donated by the Air-King Model Co., of Portland, Oregon.

Seventeenth prize is a kit of parts for building a 50-inch rubber-powered cabin endurance model airplane, which was donated by Paul K. Guillow, of Wakefield, Mass.

Eighteenth to twenty-third prize, inclusive, consist of copies of "Your Wings," a complete aviation "ground school" course in book form, written by Assen Jordanoff, and published by Funk & Wagnalls Co., of New York, N. Y., who donated the books.

[*Continued on page* 129]

Submarines In The Future

[*Continued from page* 64]

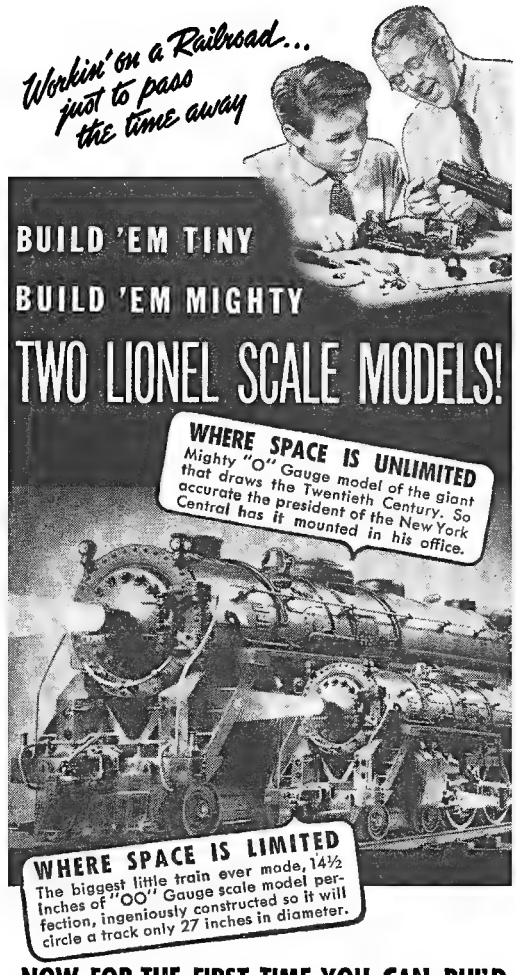
overhead, in a blind boat that cannot see a foot ahead of its nose and must steer by its instruments. The uninformed will think of such a voyage as the ultimate in reckless folly and soggy, chill discomfort. Yet it would be neither dangerous nor uncomfortable. The one very doubtful pleasure the winter voyager would be forced to forego would be his morning constitutional on a deck heaped with ice and swept by furious waves.

In 1898 I appeared before the faculty of the Johns Hopkins University and advocated the building of a submarine for use under the ice. I was ahead of my time, for the submarine had not then been brought to its present efficiency, but my argument holds good today. Nansen had just returned from eighteen months on the arctic ice in an effort to reach the North Pole, and reported that he found no ice more than fourteen feet thick. He had averaged only three-quarters of a mile a day, because he constantly met open stretches of water and vast areas of melted slush. Since then I have talked with many other explorers—Sverdrup, Amundsen, Bartlett, Stefansson, and several Russians—and they agree with Nansen that the ice is not too thick and that it is the difficulties of the surface that make polar travel almost impossible.

Take a submarine built to this order: its top like a toboggan or a ski with a downward inclined bow; the axis inclined a few degrees so that the bottom of the bow is twenty feet or more below the surface; a Sperry Autogyro steering-gear—go ahead on the motors, and you will make progress under the ice. Now and then the boat will bob up gently in an open lead and the batteries can be recharged. If you don't strike open water—what of it? A means for drilling up through the ice and projecting two casings to the open air has been devised. Through one fresh air would be taken in, through the other noxious gases expelled—as simple as that. Tests show that the drilling can be done at the rate of one foot a minute with a three horse-power motor. The recharged batteries would be good for about one hundred miles at a moderate speed.

In 1904 I made an entirely successful run under the ice of Narragansett Bay, taking with me Major Arthur Murray, later chief of Coast Artillery, and Captains E. J. Bailey and C. E Parker. In Russia I made some further experiments and was about to arrange for the construction of an under-ice boat for that government. The Russians planned to ship under the ice from the Baltic to their Pacific coast instead of by the Suez Canal, but the war with Japan ended and the project was dropped. I discussed the idea at a dinner given me by the president and directors of the North German Lloyd in Bremerhaven in 1908, but we were all too busy just then to do anything about it. Yet it was out of this talk that the *Deutschland* evolved. Other things engaged my attention until

[*Continued on page* 126]


Workin' on a Railroad... just to pass the time away
BUILD 'EM TINY
BUILD 'EM MIGHTY
TWO LIONEL SCALE MODELS!
WHERE SPACE IS UNLIMITED
Mighty "O" Gauge model of the giant that draws the Twentieth Century. So accurate the president of the New York Central has it mounted in his office.
WHERE SPACE IS LIMITED
The biggest little train ever made, 14½ inches of "OO" Gauge scale model perfection, ingeniously constructed so it will circle a track only 27 inches in diameter.

NOW FOR THE FIRST TIME YOU CAN BUILD A LIONEL SCALE MODEL LOCOMOTIVE

Whether your railroad system is "O" Gauge or "OO" you can now own a Lionel scale model Hudson, for now this masterpiece of all miniatures comes in both scales!

And now, this year, you can buy Lionel's giant, 24½-inch "O" Gauge reproduction as easily as on a time-payment plan. For it comes in five separate kits, one at a time or all at once. Five kits, only $59.50. Five dollars extra for remote control whistle and whistle controller.

All of the detail and accuracy that Lionel has built into the "O" Gauge Hudson will be found also in the "OO" model. 14½ inches long, it's a veritable power plant. Engine, cars, track and all, as low as $35. For pictures and details send for the new 1938 Lionel catalog.

Couple up with LIONEL
FOR ALL THE THRILLS OF RAILROADING

Mail Coupon Now

The Lionel Corporation Dept. QR,
15 East 26th Street, New York, N. Y.
Enclosed is 10 cents for a copy of the new 1938 52-page, full-color Lionel Catalog. Send it to:
Name_____
Address_____
City_____ State_____

New BOOKLET
ON MICROSCOPY
Free!
MICROSCOPE EQUIPMENT for the AMATEUR
THOUSANDS have found in microscopy a fascinating personal home hobby. A new 20-page booklet tells what to look for through a microscope, how to begin your exploration into the mystic unseen world. Write for your free copy today.
At left, precision Bausch & Lomb Model R Microscope, 75 to 300 power, with 455-page book, $21 Book alone, $5.00. Other microscopes, $14.50 to $774.50.
BAUSCH & LOMB
246 BAUSCH ST., ROCHESTER, N. Y
BAUSCH & LOMB
MICROSCOPES

NOW a DYNAMIC
HEAVY DUTY
INDUSTRIAL WELDER
for Only
$19.95
RETAIL
WORKS Off 110-Volt Light Socket. This marvelous Dynamic Power Welder does the work of much higher priced types. It is easily portable. WELDS Cylinder Blocks, Bumpers, Fenders, Tanks, Farm Machinery, etc. Will also solder and braze on the lightest material. Works on iron, steel, tin, brass, copper and all other metals. Men without previous experience can make as much as $5.00 on a one hour repair job. Go into business—Open a Welding Shop Now. AGENTS—Make big profits selling to garages, factories, janitors and machine shops. WRITE for 10-Day Trial Offer. DYNAMIC WELDER COMPANY
2226-F R SILVERTON ROAD, CHICAGO, ILLINOIS

U.S. BUREAU OF STANDARDS Bul. 86 States "Oil does not wear out-mechanically"
MONEY BACK GUARANTEE
"RECLAIMO"
Attached to
AUTOS-TRUCKS-TRACTORS-DIESELS
ends
OIL CHANGING FOREVER!
Ordinary oil filters only remove solids and none of the other foreign destructive matter—thereby making frequent oil changes necessary.
"RECLAIMO"—The Super Filter-Refiner keeps crankcase oil Clean and Oily indefinitely by removing solids thru filtration—and gasoline dilution, water, corrosive acids thru the use of exhaust heat. Oil is only added to maintain level. Attached in place of present oil filters — makes oil changing a thing of the past.
Wm. Schwalge Patents.
THOUSANDS OF ENTHUSIASTIC OWNERS in all parts of the country testify to the amazing money-saving action of "RECLAIMO." Read some of their remarkable statements in our FREE booklet "Oil Facts"—tells you more about oil than has ever been revealed before and may save you a lot of money. DON'T DELAY!
Get a copy of this booklet from your dealer, or write to
RECLAIMO MFG. CO., 2306 N. Western Ave., Dept. N, CHICAGO, ILL.

Minerals Make Mounts

[*Continued from page* 101]

the bottom and seal on a cover. The sand is not attached in any way and will roll around with tilting or shaking, presenting different views of individual elements. Especially recommended for this work are garnet sand, magnetite sand (pass a magnet below this slide while looking through the microscope and see what happens), oolite, foraminiferal and radiolarian sands, dune sand, ocean beach sand, glass-making sand and diatomaceous earth.

Clay, loam and volcanic ash may be studied in this fashion, though the next method is better for such fine soils.

Shake up a bit of clay soil in a small bottle of water so as to make a fairly heavy suspension. Before the soil particles settle, pipette one large drop of this mixture onto a slide and set aside in a dust-free place until the water has evaporated and has left a fine and thin film of the clay particles on the slide. Add balsam and cover glass.

It is possible to make thin sections of rocks and minerals but expensive apparatus and considerable training are required. As a substitute, secure some thin flakes or slabs of various specimens by using an ice pick or cold chisel and hammer. Then grind them down on an emery wheel and finish between two hones until exceedingly thin and translucent. Mount in balsam.

Mineral and rock sections may be studied with ordinary transmitted light, like regular biological mounts, but much more is to be gained by the use of *polarized* light, which is difficult either to define or discuss even for those taking a course in physics. We will make the attempt, however.

The wave theory of light assumes that the ether vibrates transversely to the direction in which the ray of light is traveling, but that these vibrations vary through all possible transverse planes so rapidly as to show no particular direction of their own. If they can be given a definite direction, the ray of light is said to be polarized, and the instrument performing this function is a polariscope. When magnification is also introduced, we have a polarizing microscope.

Formerly the principal means of effecting polarization was by the use of two Nicol prisms, each of which is made by cutting a clear calcite prism along a diagonal axis, then polishing the cut surfaces and cementing them together again with balsam. A beam of ordinary light entering such a prism and striking the diagonal cut is split into two parts, one being refracted out of the picture and the other passed on to illuminate an object placed on the stage of the microscope. Both rays are polarized but only one is transmitted, thus cutting down the amount of light available for use and requiring a correspondingly strong initial light source.

One prism, called the polarizer, is situated beneath the condenser of a standard laboratory

microscope. The second is termed the analyzer and is placed like a cap upon the eyepiece. Both may be rotated though the analyzer is the usual one turned because it is more accessible. When the diagonals of the two prisms are parallel, the beam of light passes directly through both and the field of view appears brightly illuminated.

When the analyzer is rotated so that the position of its diagonal is at a right angle to that of the polarizer, the nicols are said to be crossed, and none of the beam light is transmitted.

The field appears black, but if optically active (doubly refractive) objects are placed on the stage, they will again polarize the light coming through the polarizer so that some of it can pass the analyzer. They glow, as if self-luminous, in a dark field. They are not only beautiful objects for observation, but yield much important information to research scientists. The amount of rotation necessary to produce certain effects can be measured, and the effects themselves indicate definite physical construction of all sorts of matter.

Today the polarizing microscope detects strain in glass, flaws in metals, adulterants in foods and textiles and in thousands of other ways adds to our knowledge of the makeup of the physical universe in which we live.

Recently there has come on the market an inexpensive form of coated plate known as a polaroid which will produce the polarizing effect and has the additional advantage of permitting cutting into strips or pieces of any desired size. A pair of polaroids can be secured at low cost to fit any type of microscope, including miniature models, and since they work best with the lower powers of magnification, have placed polarized light within the reach of everyone. (See September, 1938 issue of MECHANIX ILLUSTRATED "How To Polarize Your Microscope.")

As an example of an experiment to try with these plates, make a strong solution of salt (sodium chloride) in water, put a large drop on an absolutely clean slide, and allow to dry thoroughly, then add balsam and a cover. The salt crystalizes out as the water evaporates. You can watch this happen under the microscope, and the cubes thus formed are interesting to observe by ordinary transmitted light. When polarized, no change will be observed—salt is optically inactive.

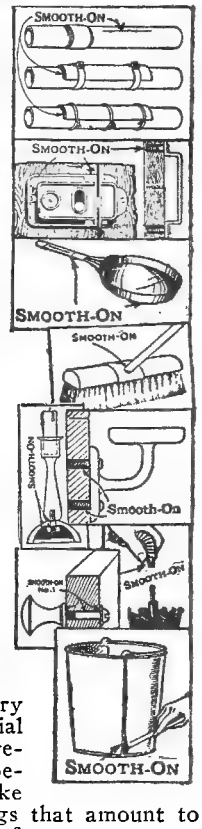
Now repeat the same procedure, this time using potassium ferricyanide, and note the array of colors shown under crossed polaroids. This salt is optically active. If you want to see gorgeous color and form under a lens, make up a saturated solution of tartaric acid and prepare a slide by the evaporation method. Not every slide so made will be perfect, but good ones should show beautiful leaf-like crystals in brilliant blues, shading off into mauves and yellows. Other subjects for polarized light include borax, aspirin, acetanilid,

[*Continued on page* 129]

Making these repairs with SMOOTH-ON No. 1 is like finding money!

Stopping leaks **at screw threads, gaskets, press-fit joints, seams, connections, cracks, etc., in water, steam, gas, air or smoke pipes, boilers, furnaces, fire pots, heaters, tanks, radiators, sinks, troughs, etc.**

Tightening **loose wood screws, bolts, nuts, handles, drawer pulls, hinges, locks, hooks, casters, stems, bases, etc.**



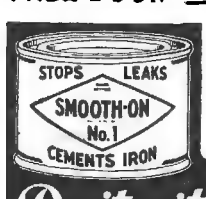
Smooth-On No. 1 has enabled thousands of householders and home mechanics to make the above and similar repairs at absurdly low cost—to restore full usefulness to many impaired household appliances that otherwise would have required expensive replacement.

Smooth-On No. 1 hardens and its adhesion and expansion in doing so effect a tightness of parts or a seal against leakage that withstands pressure, heat, cold, vibration, moisture and chemical action. The Smooth-On restores original efficiency quicker, with less effort and at less expense than by any other practical repair procedure. Try Smooth-On (no heat, special tools or previous experience required). Your worst repair becomes simple and you can make annual savings that amount to a substantial figure.

Write for FREE BOOK

Many Smooth-On repairs can be made in various ways. The one which produces the best results most economically is easily determined from the instructions and diagrams in the free Smooth-On Home and Auto Repair Booklet.

Mail the coupon for your copy and get Smooth-On No. 1 in 7-oz. or 1 or 5-lb. can from your hardware store.



SMOOTH-ON MFG. CO., Dept. 69
574 Communipaw Ave., Jersey City, N. J.
Please send Smooth-On Home Repair Book.

Name .....

Address .....

12-33 .....

Do it with **SMOOTH-ON**

ELECTRIC UNCOUPLING

New Exclusive Feature in 1938

LIONEL TRAINS

You simply press a button. An electric mechanism, in the car, lifts couplers and the train parts. Read all about this ingenious device. See color pictures of the greatest train fleet in all train history. Get new catalog NOW. Clip and mail coupon at once.

The Lionel Corporation Dept. QR
15 East 26th Street, New York, N. Y.

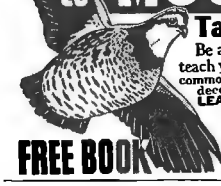
Enclosed is 10 cents for a copy of the new 1938, 52-page, full color Lionel Catalog. Send it to:

Name_____

Address_____

City_____ State_____

Learn to MOUNT BIRDS



Tan SKINS, make up FURS

Be a Taxidermist. *Double your hunting fun.* We teach you at Home. Mount Birds, Animals, Pets, common specimens. Save your hunting trophies; decorate home and den. Make genuine KROME LEATHER, tan and make up furs for spare time profit. 48 pages -- tells all about it. Hunters, get your copy. It's FREE BOOK Now Free. Send post card. State your AGE.

FREE BOOK

NORTHWESTERN SCHOOL OF TAXIDERMY
4739 Elwood Bldg. Omaha, Nebraska

CROSMAN SILENT .22 RIFLE

Adjustable peep sight

Rifled Barrel

NO CLEANING
ADJUSTABLE POWER
LOW COST AMMUNITION

Grooves inside barrel make the Crosman a real rifle with all the hair-splitting accuracy this term implies. Shoots bullet (pell) same diameter as .22 powder rifle, but silently, powerfully, with no recoil, using the terrific force of compressed air—same force U. S. Navy uses to drive 2000 lb. torpedoes. Marvelous for target, small game. Single and 20 shot repeater models. No license required. New features!

SuperPells

FREE BOOK

Best for all .22 cal. air rifles. Heavier, longer, more perfectly formed (secret process), thus harder hitting and more accurate. Made to American standards by American workmen. Free folder.

Containing important target and game shooting facts; also Crosman Catalog. Write. Ask Your Dealer to Show You a Crosman.

CROSMAN ARMS CO., Inc., 405 St. Paul St., Rochester, N. Y.

Submarine In The Future

[*Continued from page* 123]

the Lake Company was closed down. One day I read an interview with Sir Hubert Wilkins, who had just made his first flight across the Arctic:

"There were no suitable landing places," he said. "I think the Pole could most easily be reached by submarine."

I met him along with Captain Sloan Danenhower, who had at one time been in command of submarines in the United States Navy, and later had represented the Navy in charge of our builders' trials at Bridgeport during the testing of new submarines. The Lake-Danenhower Company was formed, the plan being to use the old *Defender*, built in 1907, but later we were able to borrow the O-12 from the Navy. It was a much larger and more powerful vessel and was one of those scheduled for destruction under the Balfour agreement. We agreed to pay one dollar a year and, when we were through with her, return her to the Navy for destruction.

I designed a new superstructure and put in a diving compartment which later enabled scientists to collect specimens of arctic marine life through an opened door. On its first expedition, the submarine proved the practicability of traveling through and under heavy ice. It seems that much valuable data was accumulated in determining the contour of the arctic water bed, and I understand that Dr. Sverdrup, one of the scientists on the expedition who spent many hours in the diving compartment, is preparing a book describing this work. One of these days some one, government, transportation company, or well-to-do individual, will build the right kind of a submarine for under-ice and commercial work, and overnight it will be accepted as other mechanical advances of the day have been. Such a submarine should be more rugged than the military type, and the propelling machinery should be designed for giving a powerful thrust at a slow speed rather than for fast going. The expensive installations required for armament and for quick submergence could be dispensed with and the cost reduced to about one-fourth of a military craft.

When one considers that about three-quarters of the earth's surface is covered with water and that there are treasures known to be awaiting us in the depths, it seems certain that eventually commercial-type submarines will be found in every sea. It has recently been reported that the radium content of the red clay found a certain place on the sea bottom is far greater than in the richest ore as yet discovered. Gold can be washed out on the sea bottom, the cargoes of sunken ships can be recovered, pearls found, sponges taken, and perhaps—who knows?—that old road that leads down into the sea may be traced direct to the Lost Continent.

I'd like to make that trip over the bottom that Dr. Beebe talks about and, perhaps, drift the boat through the streets of Atlantis and peer in through the windows of the drowned palaces. Who knows?

Build "Ice-Sprite"

[*Continued from page* 121]

and bolt them to the front runnerplank so that the runners, when attached, are exactly 84 inches apart—center to center. The front runnerplank can be attached to the hull at this time. Before tightening the bolts square the runners with the runnerplank and align them precisely fore and aft to avoid all possibility of drag.

The duplicate rudder posts and the steering assembly are made to the plans given. The actual details of the tiller post and steering post assembly may be varied to suit materials available but in any case the most careful alignment of the two 8-inch grooved wheels is imperative. Bolt the steering post and pulley to the rear runnerplank exactly in the center with the pulley extending below the hull to leave clearance for the connecting cable. The tiller post is then bolted down to the cross member in the cockpit with the pulley aligned with the steering post pulley.

The rudder posts are anchored to the runnerplank ends in the manner shown and exactly 84 inches apart, center to center. The rear runners are attached in the same way as the front ones with ½-inch steel king bolts. All runners should hobble freely without side play.

Next bolt the rear runnerplank to the hull and connect the steering cables and rods, squaring the plank to the hull and making sure the runners are absolutely parallel by adjusting the rods. Use an 8-foot batten to determine the equidistance of the fore and aft ends of the runners. Adjustments are made with a turnbuckle on the cable and with screwclevices on the rods. The cable connecting the pulleys may be hooked up as shown or crossed. By crossing the cable the tiller action will be positive as in steering a car.

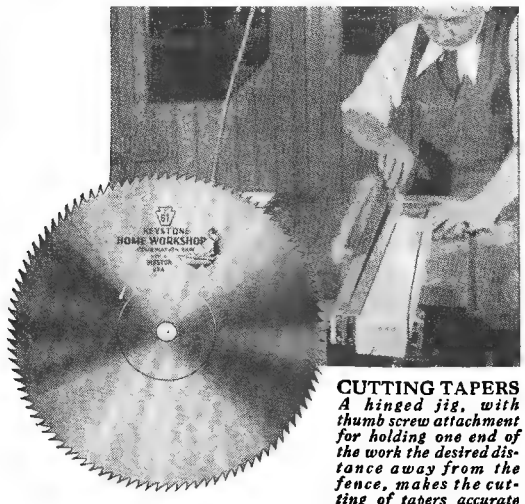
The oak mast step has a hole drilled to take the ½-inch bolt with head sawed off which is inserted in the mast foot as a pivot (see page 93). Screw the step in place on the deck so that the mast foot is centered exactly 27 inches from the bow end of the hull.

Mast and spar details are covered in the drawings. Note that the mast is made in two halves —each piece grooved and slotted to form a sail and bolt-rope track when glued together. The boom is made similarly.

The forestays can be of $\frac{3}{16}$-inch airplane cable or of $\frac{3}{8}$-inch rod to suit. They are attached as shown. The unique bow-shaped wooden guys which form the after stays are made up of 6 laminations of ¼x3-inch basswood strips held together with casein glue. These bow-shaped stays allow the boom to be let out freely in a high wind without danger to novices.

The foot end of each of these stays is anchored to an angle iron plate which also serves as the anchor plate for the rudder post. This detail is clearly shown in the drawings on page 93. The

[*Continued on page* 128]



CUTTING TAPERS
A hinged jig, with thumb screw attachment for holding one end of the work the desired distance away from the fence, makes the cutting of tapers accurate and easy.

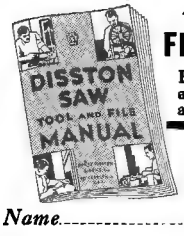
Amazing money's worth KEYSTONE made by DISSTON CIRCULAR SAWS

Very little money buys a dependable blade . . . a KEYSTONE Circular Saw—made by DISSTON! Expert sawmakers designed these saws specially for fine craftsmanship, at low cost, in your home workshop.

Keystone Saws are amazing values—$1.70 to $2.40 for 6" to 10" sizes. They fit your machine and suit your work. Run true, stay sharp. Ask your dealer for Keystone Home Workshop Circular Saws—made by Disston.

Cross-Cut; Rip; Combination
6" (½" hole) $1.70 — 8" (½", ⅝", ¾" hole) $2.00
7" (½" hole) $1.80 — 10" (⅝", ¾" hole) . . $2.40
Rip Saws slightly less
Also Hollow Ground, $3.00 to $5.00

Also KEYSTONE made by DISSTON Hand Saws. Skew-back and straight, cross-cut and rip. Prices, $1.00 and up. K-3 "Pacemaker," skew-back, 26" blade, $1.50
Prices slightly higher in Canada



FREE BOOK SEND COUPON

For free copy of "Disston Saw, Tool and File Manual"—tells how to sharpen all kinds of saws, send this coupon to:

HENRY DISSTON & SONS, INC.
1208 Tacony, Philadelphia, U.S.A.

*Name*_____

*Address*_____

FREE
64 PAGE
Xmas Catalog
GIFT VALUE like this
PHOTO ENLARGER
Complete with "Leack Definon" f.4.5 anastigmat lens, Ruby lens filter; condenser system; unique clamping device permits adjustable framing. Linear magnification 2 to 10 diameters. Masking device for up to 1½ x 1½" negatives. Size of board 15½"x 11¾". SPECIAL Only..... $23.95
GIFT CATALOG
GIVE
finer gifts — and save money this Christmas! Send for our 64 page Gift Catalog jammed with a COMPLETE line of Cameras and Photo Supplies, Lafayette radios, electric shavers, clocks, trains . . . a whole toyland of children's gifts — at prices that put money back into your pocket. Mail coupon now!
WHOLESALE RADIO SERVICE CO. INC.
NEW YORK, N.Y. • CHICAGO, ILL. • ATLANTA, GA.
100 SIXTH AVENUE 901 W. JACKSON BLVD. 265 PEACHTREE STREET
BOSTON, MASS. • BRONX, N.Y. • NEWARK, N.J. • JAMAICA, L.I.
WHOLESALE RADIO SERVICE CO., INC.
100 SIXTH AVENUE, NEW YORK, N. Y.
Rush FREE 64 Page Gift Catalog No.75-22M8
Name.....
Address.....
City.....State.....
LET "VALU-BILL" BE YOUR SANTA
PASTE COUPON ON PENNY POSTCARD

60 POWER TELESCOPE $2.19

VARIABLE EYEPIECE. 20X—40X—60X

NEW! Three telescopes in one. 3 different magnifications. 20 power for ultra-bright images with 40 and 60 power for extra long range. Guaranteed to bring distant objects, people, sports events, ships, moon, stars, etc. 60 times as close. Most powerful made for anywhere near the money. Closes to less than a foot in length. Multiple lens system. 30 mm. objective lens. 5 sections. Directions included for using as a compound 4 lens microscope. American made. We pay the postage. Only $2.19.

Catalog of Microscopes, Binoculars, etc. FREE on request.

BROWNSCOPE CO., Dept. 712, 5 W. 27th St., New York, N. Y.

NOW... ANYONE CAN *Easily* CUT NEW TREAD on OLD TIRES with this SIMPLE INVENTION

WORKS OFF AUTO BATTERY OR LIGHT SOCKET

A NEW invention makes it possible for anyone, without previous experience, to regroove the exact tread on old tires. Puts new tread on bald tires. This *Re-Nu Tire Groover* is a fine, precision built, sturdy device that does a FIRST CLASS JOB *QUICKLY* and *EASILY*.

STOP DANGEROUS SKIDDING!

Countless tires are lost annually due to skidding caused by smooth tires. Protect yourself by regrooving your old tires. Don't throw away good casings just because the tread is worn. Have road-gripping tread to give traction where needed. Positively guaranteed to satisfy or money refunded. MAKE BIG MONEY for yourself REGROOVING tires for your friends and neighbors.

FREE OFFER to AGENTS—Every garage, service station, fleet and car owner a prospect for a Re-Nu Tire Groover. By helping us introduce it, you get yours FREE and make big profits for yourself besides. Write for Free particulars today.

RE-NU TIRE GROOVER CO., 2615-AT Michigan Av., Chicago, Ill.

Thrills And Spills With Racers

[*Continued from page* 120]

flooded. When they get the yellow flag designating a clear track the midgets leap forward with a roar as though shot from a cannon.

Drivers like Garson, Peterson, Gesel and Schneider eat fairly well. They may earn $1,500 to $2,000 in a two-month racing season. Most of them don't own the cars and have to split their winnings with the owners who get 60 per cent and all the repair bills and headaches while the drivers get the bumps and 40 per cent. Still, it pays—if you're a consistent winner. In two months at the Roosevelt raceway, Joe Garson made $1,725; Peterson earned $1,700; Ted Hartley earned 1,263 and Harry Sheeler made $1,182.

But what about the drivers who never win; who earn $150 to $250 and never see the inside of the pay-off? Individual tracks have their own particular means for keeping drivers on tap. They realize that everyone can't win, so they scatter the winnings and, as at the Roosevelt track, every man who enters a race gets at least $3, even though he never finishes. Roosevelt track has paid out $23,000 in 22 races. An evening's racing consists of 9 heats of which the first four pay $56 among 8 men. The fifth and sixth pay $135 each, divided among 10 men. The seventh pays $68 and the eighth pays $90. The feature pays $248 among 14 starters. Tops is $58, next is $41 and the rest of the money is graded so that the last of the 14 starters receives $3. If a driver wins all his heats, he can gross $140 for the evening—but few ever do.

The $3-men, starters who never get going, are able to stay in the game chiefly because garage is free and track officials provide them with free cots and blankets. The consolation money is enough to provide them with food.

Danger rides at the wheel in every race and the driver who runs afoul of "Misfortune" has the choice of crashing into the guard rail or heading into one of the many bales of hay scattered about the infield to soften the fall. But sometimes the driver has no choice and he crashes suddenly and hard. The knowledge that a spectacular spill may occur at any moment, with four or five cars piling up, packs the spectators in. So for the present, at least, it's a great day for the midgets!

Build "Ice-Sprite"

[*Continued from page* 127]

mast, when properly rigged is raked aft 48 inches.

As this ice boat is fast and suitable for racing the sail should be made with pockets sewn in for full-length battens (slats) to control the flow of sail as is necessary for racing. In ordering the sail from your sailmaker specify an additional bolt-rope for hoisting.

Runners and other metal parts can be finished with aluminum paint. The seat, back-rest and cushions are left to the builder's discretion.

"Men With Wings" Contest

[*Continued from page* 122]

CONTEST RULES

Anyone except employees of Paramount Pictures and Fawcett Publications can enter the contest. The prizes will be awarded to the 23 persons who, in the opinion of the judges, send in the most nearly correct answers to the ten aviation questions listed in the box on page 79 and the best 25-to-50-word letters on the subject —"Who Is Aviation's Greatest Hero?"

Editors of this magazine are the judges in this contest and their decisions will be final. No entries will be returned. Contestants have until midnight of December 27, 1938, to mail in their entries, and the winners will be announced in the March, 1939 issue of MECHANIX ILLUSTRATED. Address entries to: Contest Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

Minerals Make Mounts

[*Continued from page* 125]

copper sulphate, grape sugar, mica, gypsum, cotton, linen and silk fibers, lens paper, and hairs from persons and animals. Examine first under ordinary and then under polarized light. You will be amazed and delighted at the effects secured!

Carbon Derivative Creates New Industry

A new industry is growing up near Green, West Virginia, around "silica black," a new carbon and silicon-bearing material derivative discovered six years ago by Prof. C. A. Jacobson of West Virginia University.

Produced when coal and a material like diatomaceous earth are mixed and distilled at 600 degree Fahrenheit, "silica black" is an inky-dark powder for which a wide variety of uses is being found, Dr. Jacobson reports.

It is being used as a filler to give paints durability and the ability to resist heat. It is finding application as a supporting medium for finely-powered nickel, used in chemical process whereby hydrogen is added to vegetable oils to make edible fats.

Use as a reinforcing pigment in rubber and plastic molds has also been found. Its high temperature resistance qualities have enabled manufacture of a gasket paste with it that can be used on metal joints which, when heated to nearly 1,000 degress Fahrenheit, will keep the gaskets from burning up. The paste is also useful in applying heater hose in automobiles, on joints in contact with various types of solvents and vapors.

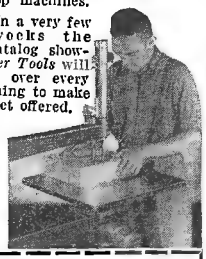
Treet Safety Razor Corporation, Newark, New Jersey

READY SOON!
NEW & Improved BOICE-CRANE "shop tested" MACHINES
NEW 1939 Catalog — Write for Your Copy NOW

● **NEW MACHINES** More up-to-the minute BOICE-CRANE Power tools ready soon for craftsmen wanting the most modern, really quality-built equipment for their shops. *See them before you buy anything.*

● **NEW FEATURES** BOICE-CRANE designers have again perfected new, practical features, for easy, flawless machine operation that *no others will give you.* Features you'll surely want on your shop machines.

● **NEW CATALOG** In a very few weeks the New BOICE-CRANE Catalog showing *the year's finest Power Tools* will be ready. You'll thrill over every page. We've spared nothing to make our 1939 line the finest yet offered. Reserve a copy NOW. As soon as it's ready we'll mail you one postpaid!



USE COUPON
Include 10c for 16 pg. Metal Spinning Instruction Book.

BOICE-CRANE CO. Dept. 8128 Toledo, Ohio
Catalog FREE. If Spinning Book wanted, send 10c.
Name .....
Address .....
City..... State.....

BE A CAMERA REPORTER

MAKE YOUR CAMERA BRING YOU A CASH INCOME. Interesting, Easy-to-Learn, Spare Time Course Prepares You For Exciting Profession. Earn Money While You Study! Camera Reporting. Picture shooting, for scores of newspapers and magazines. A high paying profession that any man or woman can enter! YOU NEED NO EXPERIENCE. You learn by doing. Tasope' trains you for a good job, or you can work for yourself. Most modern practices, including natural color photography! All popular cameras. Low Cost—Easy Payment Plan. Write for Beautiful Free 32-Page Photo-Illus. Book.

NO EXTRA CHARGE for a short course in Photography when taken with our PHOTO-ENGRAVING COURSE.

TASOPE' SCHOOL OF MODERN PHOTOGRAPHY, Dept. 8L8, Aurora, Mo.

EASIEST to Master This New P-A

● **Such beautiful tone, and so easy to play! Just touch a key and blow normally; you can't miss. Nothing to compare with these new P-A Saxes, Clarinets, Trumpets, and other P-A instruments. Fully guaranteed; your success assured. See your music dealer or write direct for beautiful, free book. No obligation. Easy terms.** 1286

PAN-AMERICAN
1230P-A Building Elkhart, Indiana

Shower Unit Is Portable

Designed for use in auto trailers, farms, camps and shops where running water is not available, a portable shower unit has been developed by a manufacturer in Chicago, Ill. The unit is supplied with an overhead tank, which holds enough water for two showers, and a transparent curtain, being attached to the wall by a metal plate fitted with several screws.

Air Conditioned Gold Mine Increases Production

Air conditioning of the Hercules shaft of the East Rand Proprietary Mine, one of the world's greatest sources of gold, has enabled operators to take 50 per cent more gold ore from this shaft at no increase in operating cost, the Central Mining and Investment Corporation of Johannesburg, South Africa, reports.

The only air-conditioned mine in the world, the high rock temperatures in the deeper parts of the mine are reduced by a cooling unit that supplies 150,000 cubic feet of cool air and enables the deep deposits to be worked.

When you complete a how-to-build project, why not send a photo and description of it to the Editor's Workbench department? Perhaps you will be awarded one of the many cash prizes offered by MECHANIX ILLUSTRATED each month. (See page 12).

Airplane With Molded Body Being Readied For Tests

Opening up wide possibilities for rapid manufacture and assembly of airplanes, a plane whose fuselage is made from two pre-molded pieces of plywood bonded by a synthetic plastic is being readied at a Hagerstown, Md., factory for acceptance tests by the Bureau of Air Commerce. The new plane, built by the Clark Aircraft Corporation, already has more than 60 hours in the air to its credit and is reported to be highly promising in performance and the U. S. Army is interested to the point that it has a similar plane, made by the same manufacturer, under trial by the Material Division of the Air Corps at Wright Field, Dayton, Ohio.

Great importance is attached to this and similar developments in view of the quick-manufacture possibilities inherent in plastic materials and to concentrated attention such planes have been receiving abroad.

The plane's fuselage is made of two molded halves which are made of a laminated plywood bonded by a synthetic resin developed in Germany, according to the same source of information. With a gross weight in the neighborhood of 4,500 pounds it is about the same size as the larger private planes, being equipped with a 450 horsepower, 12-cylinder V-type engine.

Planes made of plastic materials have been tried in the United States several times in the past, but they have not made great progress to date. An advantage derived from use of the material is speed in assembling the fuselage. Since airplanes are still largely hand-assembled, this is a factor of importance.

Although it is understood that the material used in this case was not one of those tested by the National Bureau of Standards, laminated plywood of the type used has a high strength to weight ratio, an all-important consideration with aircraft.

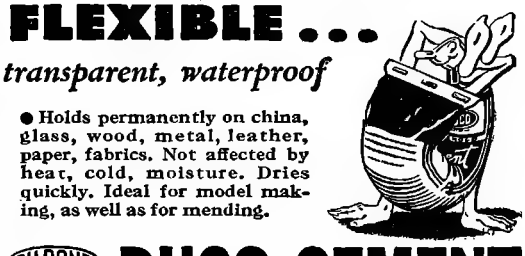
New Grade Chemical Makes Translucent Rubber Better

A new grade of magnesium carbonate, used in making translucent rubber products, has been developed by chemists as a step in both improving translucent rubber and lessening American dependence on foreign imports of the substance.

Improvements in translucent rubber products manufactured with it are attributed by its discoverers to the fact that it bends light rays to exactly the same degree as they are bent by translucent rubber. In technical language, the new crystalline substance has the same refractive index as rubber.

Finland is considering the start of a nitrogen industry.

See
THE BRAND NEW
CORONA
Zephyr
CASE AND MACHINE WEIGH ONLY 8 lbs. 15 oz.
A real typewriter—and, at $29.75, a sensation! Steel case, standard 84 character keyboard, backspacer, etc.—yet tucks away in desk drawer or traveling bag. You have to see it to believe it . . . so see it!
$29.75
L C SMITH & CORONA TYPEWRITERS INC
Desk 12, 187 Almond St., Syracuse, N. Y., I'm thinking of buying a Corona Zephyr. Please mail free booklet.
Name
Street
City State


FLEXIBLE . . .
transparent, waterproof
● Holds permanently on china, glass, wood, metal, leather, paper, fabrics. Not affected by heat, cold, moisture. Dries quickly. Ideal for model making, as well as for mending.
DUPONT
REG. U.S. PAT. OFF.
DUCO CEMENT

BUY ONE OF THESE
"BIG LITE" DELTAS
$1.50 Less Battery
$3.35 Less Battery
POWERAY (above) New 6-volt electric lantern with powerful 700 ft. spot beam. 80-100 hours light. 4½ in. reflector. Unbreakable lens.
POWERLITE (at side) America's finest electric lantern. 6-volt. 2 reflectors — front, shoots 800 ft. beam; top, gives wide floodlight. 80-100 hours light. Unbreakable lens. At sport, hardware and electrical dealers or write direct to
Delta Electric Co., Marion, Ind. Dept. 450

A PIMPLE-FACED OUTCAST AT 17?

Read how to help protect the skin against intestinal poisons

Are you shunned and pitied because of repulsive-looking hickies? Then why not get right at a common cause of this trouble—and take steps *now* to help overcome it?

Between the ages of 13 and 25, final growth takes place. This is often accompanied by disturbances throughout the body. The skin may become over-sensitive. Waste poisons from the intestines often get into the blood, then ugly pimples may break out.

Many young people help solve this problem—simply by eating Fleischmann's Yeast. Each cake of this famous fresh food helps eliminate intestinal waste poisons from your body *before* they can get into the blood stream . . . and so gives these pimples a chance to clear up.

Don't run the risk of permanent scars by neglecting such pimples. Start eating Fleischmann's Yeast now—3 cakes daily—one cake ½ hour before meals. Begin now!

MICROSCOPE SUBSTAGE LIGHT

Can be used with any Microscope. Supplied complete with bulb, cord, plug, 6 colored Filters. Finished in rich black crackle enamel. $1.00 Postpaid.

COOLED CONDENSER LENSE

Condenser adjustable to any angle or height by slight pressure. Mounted on rigid base. Condenser held in elastic clamp. Finished in nickel and black. $1.00 Postpaid.

MICROTOME

Sturdily built precision Instrument Graduated to 4/10,000 Micromatic feed. Takes up to ⅜" specimen. Complete with Instructions. $3.00 Postpaid.

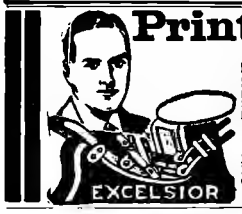
PENN INSTRUMENT WORKS

Est. 1909 — 830 Race St. — Phila., Pa.

SHORT CUTS IN ARITHMETIC

This book, fully illustrated, presents in a very simple manner amazing new short cuts in multiplication, division and other arithmetic processes. Don't be slow with figures. Learn how to multiply mentally 85x65, 67x63, 66x28, 996x987, 658x999, etc. Do these and similar problems faster than you can say Jack Robinson and without a pencil. Send 50 cents for this valuable book.

JAYEL PUBLISHING CO.
Dept. 1046, 10 West 47th St. New York, N. Y.



Print Your Own

Cards, Stationery, Advertising, labels, paper, circulars, tags, etc. Save money and time. Sold direct from factory only. Junior Outfit $9.00. Senior outfits $17 and up. Do popular raised printing like engraving with any of our presses.

Print for Others, Big Profits

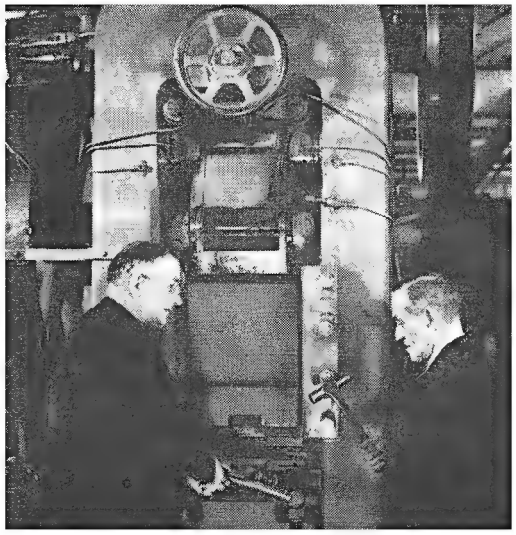
Pays for itself in a short time. Easy rules sent. Write for free catalog of outfits and all details.

KELSEY PRESSES, D-9, Meriden, Conn.

SpeedWay
Real Quality Tools
Designed, manufactured and guaranteed by SpeedWay for 30 years leading manufacturers of industrial drills, these are really fine tools, correctly designed, correct speeds, genuine high torque drill motors. Small, handy, powerful: 1000 RPM—drill handles to ¼" in steel. Die cast handle and gear housing, $7.95. 20,000 RPM Grinder with collets for ⅛" and 3/32" arbors, equal in every way to grinders costing several times $5.05. No. 250 KIT, both drill and grinder with 5 accessories in steel carrying case $14.95. Complete line of accessories and drill press stand. Write for
DRILL $7.95
GRINDER $5.95
SET $14.95

circular. Dealers Write! SpeedWay Mfg. Co., 1860 S. 52d Ave., Cicero, Ill.

Old And New In Automobile Production Equipment



IN THE photograph above, R. D. Reilly, superintendent of the Oldsmobile axle division, is shown explaining the working of a powerful parts press to Charles H. Blades, 78 (right), who holds the blacksmith's hammer with which he hammered out auto parts 41 years ago. The huge press exerts a pressure of 400 tons and is used to compress knee-action parts to proper size.

Photographic Projection Lets Baker "See" Inside Of Bread

The baker can now look inside a slice of bread to check the bread's uniformity, openness and other characteristics playing a large part in determining its quality.

A photographic projection means, by which light is transmitted directly through the slice of bread, focused and directed on photographic paper, was described by William H. Cathcart, of the American Institute of Baking, recently, before the American Association of Cereal Chemists.

No negative is required, a direct print being made, Mr. Cathcart explained. The process is said to be cheap and simple to operate.

When you complete a how-to-build project, why not send a photo and description of it to the Editor's Workbench department? Perhaps you will be awarded one of the many cash prizes offered by MECHANIX ILLUSTRATED each month. (See page 12).

Amateur "Sky Sleuths" Hold 27th Annual Convention

America's amateur "sky-sleuths," known as the American Association of Variable Star Observers, held their 27th annual meeting at the Ladd Observatory of Brown University in Providence, R. I., recently.

Since its founding in 1911, the association has piled up a total of more than 600,000 observations. Its present 350 members are now adding to this amount to the extent of some 50,000 observations a year. One member alone, Eugene H. Jones of Goffstown, N. H., has been making about 4,000 observations annually, according to Prof. Charles H. Smiley of Ladd Observatory.

The amateur astronomers, many of whom work with small telescopes they have constructed with their own hands, are gathering astronomical data which are invaluable to professional astronomers. The wide distribution of the membership—in 30 states and 17 foreign countries—assures a fairly continuous record of the ups and downs in the brightness of interesting or unusual variable stars. Clouds may obscure the heavens in one section of the land but there is a good chance that elsewhere, with a clear view, another observer will be able to make crucial observations.

While originally organized to study the brightness of variable stars, the association has now expanded its work and now sponsors five other lines of astronomical research; the search for bright novae (exploding stars), the observation of asteroids (tiny minor planets), the observation of red stars with red filters, lunar occultations and their reduction, and photographic photometry of variable stars.

Rare Earth Elements Found In Hickory Tree Leaves

Chemical elements so rare that they are merely names in a list even to most chemists have been found in the leaves of a hickory tree growing on a mineral vein in a Virginia mine. Analysis by the delicate spectrographic method has betrayed their presence in at least trace quantities, it is announced in a recent issue of the journal, Science, by Drs. W. O. Robinson and Richard Whetstone of the Bureau of Chemistry and Soils, and Dr. Bourdon F. Scribner of the National Bureau of Standards.

The elements all belong to the group known as the rare earths. They are listed as follows: cerium, lanthanum, praseodymium, neodymium, yttrium, samarium, europium, gadolinium, dysprosium, erbium, ytterbium.

Craftsman or just a casual reader, you'll find MECHANIX ILLUSTRATED entertaining and instructive EVERY issue.

"STALLING ALL CARS! DON'T USE ANTI-FREEZE TILL YOU CLEAN OUT WITH SANI-FLUSH!"

OLD MAN WINTER has two strikes on you, if you put anti-freeze in a dirty radiator. Rust and scale choke the cooling system. Your motor overheats. You waste anti-freeze. You waste power. And you risk costly engine repairs. SANI-FLUSH makes it easy and inexpensive to keep radiators clean.

Just pour 10c worth of SANI-FLUSH in the radiator. (25c for the largest trucks and tractors.) Follow directions printed on the can. Run the motor. Drain. Flush. Refill with water and anti-freeze. Then you're all set for the winter. The delicate veins that circulate water are free and open. Motors run efficiently. SANI-FLUSH can't injure motor or fittings. You'll find SANI-FLUSH in most bathrooms for cleaning toilets. Sold by grocery, drug, hardware, and five-and-ten-cent stores. 25c and 10c sizes. The Hygienic Products Company, Canton, Ohio.

Sani-Flush Safe NOT CAUSTIC
KEEPS RADIATORS CLEAN

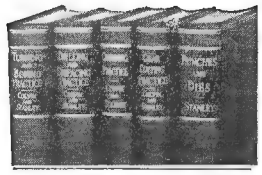
BEAN'S CANOE SHOE

Made of high grade tan elk leather with double oil tanned moccasin sole, rubber heel and Talon Fastener. Used for many purposes around camp and cottage. Colors, brown and black. Sizes 3 to 12. Widths D, EE.

Write for Catalog
Mfd. by
L. L. Bean, Inc.
Mfrs. Hunting and Camping Specialties
269 Main St.
Freeport, Maine

$2.90
Postpaid

This Library of modern machine shop practice helps men get ahead



Newly assembled—specially priced—these five recent books give you the practical facts on modern machines, up-to-date methods you need to advance in machine shop work. Take advantage of the other man's experience as found in books, to solve your problems, increase your efficiency, with

The New AMERICAN MACHINISTS' LIBRARY

5 volumes—2014 pages—1853 Illustrations

(*A combined home-study course and reference library*)

This library of machine shop practice was written for practical men. It gives you the best methods for every kind of machine shop work. It deals fully with lathes, drills, and other machine tools and their operation, automatic screw machines, speeds and feeds, gear design and production, punch and die work, metal surfacing, etc., etc. Plainly written—completely illustrated—the best kind of help to the machine-shop man who wants to advance himself.

No money down—special price—easy payments

FREE EXAMINATION COUPON

McGRAW-HILL BOOK CO., Inc., 330 W. 42nd St., New York, N. Y.
Send me for 10 days' free examination the new American Machinists' Library. If satisfactory I will send $1.50 in 10 days and $3 monthly until the special price of $16.50 is paid. If not wanted, I will return the books postpaid. (To insure prompt shipment write plainly and fill in all lines.)

Name _____
Address _____
City and State _____
Position _____
Company _____ MMx-12-38

We have Everything
PHOTOGRAPHIC *New or Used at attractive Prices*

BUY NOW *for CHRISTMAS!*
MAKE IT A PHOTOGRAPHIC ONE

Cameras, Miniatures, Movie, or Still; Projectors, Enlargers and Accessories at PRICES TO FIT EVERY PURSE. Write us your wants, get our Prices and Suggestions. Address letters to Dept. MX12.

TRADE-INS Accepted—Liberal Allowances.
"Service Is Our Motto"
CAMERA EXCHANGE ORIGINATORS SINCE 1890.

NEW YORK CAMERA EXCHANGE
109 FULTON ST. NEW YORK

LITTLE AD—BIG BARGAIN

● Magnificent 12-volume World's Popular Encyclopedia at the unbelievable price of only $4.89 *complete* for all 12 volumes. More than a million people have enthusiastically accepted this sensational offer in the last year! Authentic, up-to-date information on over 40,000 subjects. More than 3800 pages. Full library size. Over 3 million words. Profusely illustrated. Beautifully bound in midnight blue fabrikoid decorated in red and gold. *All 12 volumes* yours for only $4.89. Less than 41c a volume. ***Money Back Guarantee!*** Send only $1. When set arrives, pay postman only 89c plus postage. Balance—$1 a month. Satisfaction guaranteed or money refunded if set is returned within 5 days. Address World Syndicate Publishing Company, Dept. MI, 2231 West 110th St., Cleveland, Ohio.

Water Declared Important Part Of Molten Rocks

Water is an important component of molten rocks, even though at high temperatures it is a gas, reports Dr. George W. Morey, geophysicist of the Carnegie Institution of Washington, describing his researches into rock chemistry before the New York Section of the American Chemical Society.

"Liquids dissolve gases," says Dr. Morey, "but when dissolved the gas is no longer a gas but one component of the liquid." He likens the dissolved water (a gas at rock temperatures deep in the earth) to the carbon dioxide dissolved in the water in a bottle of soda-pop. Until the pressure is released, the dissolved gas is a part of the liquid.

Deep in the earth, molten rocks, during the various cooling processes which lead to the formation of ore bodies, drop out one component after another, causing the proportion of water in the melt to increase, and to become more important in the later stages of the cooling process. During these closing stages of volcanic activity, when water is chemically very important, hot springs are the means of escape of the excess heated water.

Practical Magnetic Phone Developed By Engineers

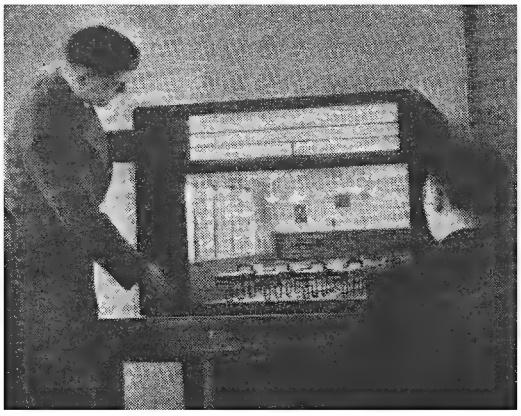
A magnetic telephone requiring no battery or other source of outside electric current for its operation has been developed by engineers of the Bell Telephone Laboratories. Depending on voice vibrations to move an armature placed in the field of a permanent magnet for generating the current which carries speech, the same unit may be used as receiver or transmitter.

The instrument recalls early telephone receivers and transmitters which likewise were magnetic and used no outside source of current. They had, however, too low an output to be practical. It is only in recent years that knowledge of highly magnetic materials and structure has enabled practical use of this type of circuit.

Independence of batteries or other outside power source makes the instrument extremely portable and suitable for use in places such as construction camps. A special portable unit weighs less than two pounds. A wall unit contains separate receiver and transmitter.

When you complete a how-to-build project, why not send a photo and description of it to the Editor's Workbench department? Perhaps you will be awarded one of the many cash prizes offered by MECHANIX ILLUSTRATED each month. (See page 12).

Miniature Schoolroom Tests Merit Of Lighting Systems



Providing an effective demonstration tool with which to prove to educators, parent groups and others the need for adequate lighting in schoolrooms, a miniature schoolroom, which is equipped with various types of scale lighting systems, has been developed by a well known electrical products manufacturer. The model room measures 38 inches in width, 30 inches in height and 42 inches in depth. Fully equipped with miniature desks, chairs, blackboards and lighting fixtures, the model weighs about 260 pounds. The control system of the model schoolroom enables the operator to simulate lighting conditions as they exist in many real schoolrooms and switch to the ideal lighting system to which pupils are entitled.

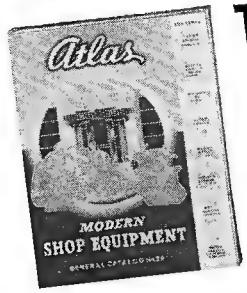
Machine Tests Pavement's Reaction To Sharp Blows

An automobile tire swinging on the end of a set of aluminum rods has been set to work by the U. S. Bureau of Public Roads to test the reaction of pavement to sharp blows and steady forces, an article in *Public Roads*, published by the U. S. Bureau of Public Roads, reveals.

The unique road-testing machine, L. W. Teller and James A. Buchanan write, imitates closely the effects of an automobile standing on a road and the effect of a car or truck hitting the road after striking a bump, thus enabling engineers to check up on the behavior of the road material.

Impact forces are tested by allowing the wheel, which is mounted at the center of percussion of the pendulum, to swing against an upright slab of concrete, so constructed as to approximate road conditions. Accurate instruments record the amount of bending and other pertinent information.

READY



THIS MONTH
NEW 1939
Atlas
CATALOG

It's the biggest and most important Catalog Atlas has ever published . . . filled with new ideas for making your work with machine tools more interesting and profitable. Shows all the new Atlas 1939 developments and sensational machine tool values. You'll prize this book. Write for it now.

SEND THIS COUPON FOR YOUR COPY TODAY

ATLAS PRESS CO.
1252 N. Pitcher St., Kalamazoo, Mich.
Kindly send me your 1939 Catalog on: ☐ New Small Metal Lathe ☐ New 10" Metal Lathe ☐ New Metal Shaper ☐ Wood Lathes ☐ Arbor Presses ☐ Drill Presses.
Name _____
Address _____
City and State _____

Atlas QUALITY SHOP EQUIPMENT Since 1911

ATLAS PRESS CO.
1252 N. Pitcher St. Kalamazoo, Mich.
LATHES · DRILL PRESSES
ARBOR PRESSES · SHAPERS

TYPEWRITER ½ Price
Yours for 10¢ a Day
Send No Money
Sent on 10 DAY FREE TRIAL

Money Back Guarantee

Positively the greatest bargain ever offered. A genuine full sized $102.50 office model refinished Underwood No. 5 for only $44.90 (cash) or on easy terms. Has up-to-date improvements including standard 4-row keyboard, backspacer, automatic ribbon reverse, shiftlock key, 2-color ribbon, etc. The perfect all purpose typewriter. Completely rebuilt and FULLY GUARANTEED.

INTERNATIONAL TYPEWRITER EXCHANGE
231 West Monroe St., Chicago, Ill., Dept. 1205
Send Underwood No. 5 (F. O. B. Chicago) at once for 10 days' trial. If I am not perfectly satisfied I can return it express collect. If I keep it I will pay $3.00 a month until I have paid $49.90 term price in full.
For quick shipment give reference and occupation.
Name _____ Age _____
Address _____
Town _____ State _____

Classified Advertisements

Rate for classified ads, 18c per word (include name, address and all numbers), per insertion. Minimum 10 words. Cash must accompany order and be received in this office October 1st for the December issue (on sale November 2nd). Address Classified Mgr., Mechanix Illustrated, 1501 Broadway, New York City.

A. C. GENERATORS

PRACTICAL changes for automobile generators. A. C. and D. C. generators, motors and welders. Complete wind and water power plants. See our advertisement at bottom of page 28. Autopower.

ADVERTISING AGENCIES, FOR ADVERTISERS

MAIL-ORDER Ad reaching 1,500,000 families throughout United States $15.40 inch. Newspaper, magazine, ratebook free. Chicago Advertising Agency, 20-M West Jackson, Chicago.

ADVERTISE: In The Sterling Digest and get results. Inch $1.50. Three insertions for the price of two. 907 North 4th Street, Sheboygan, Wis.

ADVERTISE: 24 words in 250 Newspapers $10. Lists Free. Advertising Service Bureau, 4515-B Cottage Grove, Chicago.

30 WORDS, 25 magazines, $1.00; three times $2.00. Goodall Agency, 628 Montgomery, San Francisco.

FREE NEW advertisers rate guide. Brown Advertising Agency, 140 South Dearborn, Chicago.

AGENTS WANTED

AGENTS: Smash go prices! Santos Coffee 12c lb. 4-oz. Vanilla 8½c. Razor Blades 10 for 8½c. 100 Sticks Chewing Gum 12c. Christmas Cards, 21 in box, 14c. 150 other bargains. Premiums. Experience Unnecessary. Carnation Co., MN, St. Louis, Mo.

MAN and Wife—to run local Coffee Agency. Earnings up to $240 in a month. New Ford Sedan given you as bonus. I send complete outfit. You don't risk a penny. Details free. Albert Mills, 6303 Monmouth, Cincinnati, Ohio.

AMAZING new scientific discovery cuts coal bills 40% to 60%. 50c package treats a ton. Every home and building a prospect. Agents cleaning up. Send 10c for liberal sample. Kol-Sav, Suite C6, 999 Tuscola, Detroit, Michigan.

WEAR fine hose I send without cost with outfit while taking orders for amazing new hosiery. Replacement guaranteed against holes, snags, and runs. Rush name and hose size. Wilknit, Desk 34-M, Greenfield, Ohio.

PROFIT with new products. Make, sell, repeat. Analysis, Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, CE-1142 Sunnyside, Chicago.

BIG Money applying initials on automobiles. Easiest thing today. Free samples. Also, sideline salesmen for name plates and tire cover transfers. "RALCO", 1303 Washington, Boston, Mass.

AGENTS—Opportunity make money; book containing 107 successful business plans; home-office; send for free introductory booklet. Elite Co., 214-G Grand St., N. Y.

Light on Shaver Illuminates Face

Mounted on the back of an electric shaver, a recently developed light throws a beam of light directly in the path of the cutter. No wiring is used as the light plugs in between the shaver and the connecting cord. It is made to fit almost all of the popular makes of electric shavers.

DEFROSTS Windshields Without Heat. New invention. Fits auto pocket. Defies Frost, Sleet, Ice. Samples sent on trial. Rush name. Kristee 108, Akron, Ohio.

1000 BARGAINS, Drygoods, Notions, Drug Sundries, Specialties, Novelties. Agents undersell stores. Free catalog. Jobbers, Dept. 398, 930 W. Roosevelt, Chicago.

WHERE To Buy At Wholesale 500,000 articles. Free Directory and other valuable information. Maywood MM. Publishers, 925 Broadway, New York.

BARGAIN Buyers' Guide tells where to buy most everything at extremely low prices. Information free. Write: E. D. Debout, D-M, Marion, Kentucky.

SUCCEED With Your Products. Make—Sell Them. Formulas. Processes. Accurate, detailed analyses. Catalog free. A. Thaxly Co., Washington, D. C.

BIG money applying initials on automobiles. Write for particulars and free samples. American Letter Company, Dept. 11, Dunellen, New Jersey.

BUSINESS Proposition Resilvering Mirrors, Autoparts, Reflectors, Making Chipped Glass Signs. Write Sprinkle, Plater., 850, Marion, Indiana.

MEXICAN Novelties! 100%-300% profit! Free particulars. Samples 10c stamps. Marquez-ME, Apartado 1176, Mexico City.

ATLAS Window Sign letters. Large Sizes, Penny Each. Beautiful Free Samples. Atlas, 7941-G Halsted, Chicago.

300% PROFIT Selling Gold Leaf Letters for Store Windows; Free Samples. Metallic Co., 448 North Clark, Chicago.

AFTERNOONS Free! $340 mo.—home! No canvassing. Expect surprise! Folio-S, Sta. D, Los Angeles.

AMERICAN POLICE JIU JITSU

36 KNOCKOUT Blows without use of fists, by internationally famous Jiu Jitsu instructor. Send 25c. S. J. Jorgensen, 301 Maritime Bldg., Seattle, Wash.

ARC WELDER

75-200 AMPERE arc welders from Dodge generators. Complete plans 35c. 100 other generator changes. LeJay Manufacturing, 314 LeJay Building, Minneapolis, Minn.

ART INSTRUCTIONS

ART Instruction. Learn to draw beautiful girls' heads and figures. Life poses, large charts. Free sample. Send name and 10c to cover mailing cost to Towertown, Studio 9, 520 N. Michigan Ave., Chicago.

ART NOVELTIES

FREE—"Big 32-Page Book" explaining composition novelty manufacture! Tells you how to make extra money in your spare time! Supply Limited! Write today! Stewart's Studio, Dept. M-9, 2927 Wilcox, Chicago.

AUTOMOBILES

"SEMI-DIESEL." Get in the money. City and country agents wanted. Write now. Economy! Performance! Mileage! Semi-diesel conversions for gasoline motors. Manufacturers written guarantee. Learn basic facts from free literature. Houston & Logan Conversions, 2021 Grove St., Berkeley, Calif.

MOTORISTS—Let us show you how to save $1.00 or more each month. Complete instructions, prepaid 25c. Universal, Dept. S, 2100 South 6th Street, Philadelphia, Pennsylvania.

AUTO SUPPLIES & EQUIPMENT

CONVERT your car to burn Diesel oil. Save up to 70% fuel costs. Cheap installation. Wonderful performance. Proven factory method. Different and better. Costs nothing to investigate. Write for free circular No. 5A. Harrington Company, 201-204 Manchester Building, Portland, Oregon.

AVIATION

GET Into Aviation—Airline Pilots get up to $700 a month; Mechanics, $200; Aeronautical Engineers, $400. Prepare now at this Government Approved School. Write for complete information. Lincoln Airplane & Flying School, 4002 Aircraft Bldg., Lincoln, Nebraska.

AVIATION—Train for Apprenticeship, Mechanic, Pilot, Meteorologist—Good Future. Write, immediately, enclosing stamp. Mechanix Universal Aviation Service, Wayne County Airport, Box 857, Dept. A2, Detroit, Michigan.

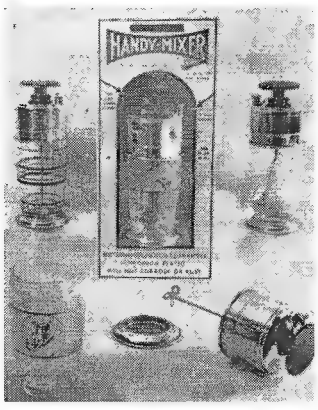
AVIATION Needs Men—Pilots, Mechanics, Draftsmen, Sheet Metal. Positions open. Learn now. Free Catalog. California Flyers School of Aviation, Dept. "MXC-12", Los Angeles Municipal Airport, Inglewood, California.

PROPELLERS for Sleds, Airplanes, Catalog 5c. Banks Propellers, Love Field, Dallas, Texas.

BICYCLES

REPAIR, Rebuild bicycles, full details $1.00. Sites Bike Shop—Broadway, Ft. Wayne, Ind.

Automatic Mixer Uses Its Own Spring Motor



This automatic drink mixer contains its own spring motor and is ready for use after a few turns of the top knob. The device is suitable for mixing malted milks, milkshakes, cocktails, beating eggs, whipping cream, etc.

BLUEPRINTS

METAL TUBE Midget Radio, the last word in compact radio receivers. You can construct this set even though your knowledge of radio is limited by following the large pictorial blueprints available, from Fawcett Publications, Inc., Greenwich, Conn., at 50c postpaid.

BOATS

BUILD Your Own Boat! 144-Page book gives complete plans and instructions for easy-to-build boats, from 7 to 27 feet. Send 50 cents in stamps, money order or check to Fawcett Publications, Dept. C-1, Greenwich, Conn., for your copy of HOW TO BUILD 20 BOATS.

ICE Yachts (new front steering), Motor Sleds (using outboard or motorcycle engine), Snowmobiles, Blue Prints, Kits and Supplies. Propellers, Counter-shafts, Bargain prices! Rush dime for details. Mead Gliders. Dept. 12-MC, 15 South Market St., Chicago.

FORD and Lincoln Marine Conversions. Send 10c for information. Lehman Engine Co., Newark, N. J.

BOOKS & PERIODICALS

SPORTSMEN'S MANUAL—The outdoors man's guide containing scores of practical articles by America's leading outdoor writers, covering every phase of fishing, hunting, camping, and trapping. This book, edited by Robert Page Lincoln, will make that next vacation a dozen times more enjoyable. Price 50c at your newsstand, or order directly from Fawcett Publications, Inc., Fawcett Bldg., Greenwich, Conn.

FREE Catalog scientific, mechanical and technical books. Readers Service, 800-13 North Clark, Chicago.

BUSINESS OPPORTUNITIES

MAKE Money electroplating! Marvelous patented invention plates with electric brush—easy as painting. Does same beautiful, permanent electroplating—gold, silver, nickel, cadmium, etc.—as big tank outfits. No liquids—lightweight—portable. Anyone can use from battery or household current. Only $6.85 complete. Write for details and sample or work done. Warner Electric Co., 360 N. Michigan, Dept. A-12, Chicago.

PLASTEX Industry needs manufacturers on small scale and for big production of Art Goods and Novelties in Plastex and marble imitation. Cheaply and easily made in our guaranteed rubber moulds. We cooperate in selling goods. You are just in time for big wholesale season now starting. Interesting booklet mailed free. Plastex Industries, Dept. R, 1085 Washington Ave., New York.

WE HELP start you in business, furnishing Outfits and Instruction, operating "Specialty Candy Factory" home. Men and women, opportunity to earn $20 to $50 weekly, all or spare time. (Our 29th year.) Booklet free. W. Hillyer Ragsdale, Inc., Drawer 110, East Orange, N. J.

WINDOW screens, screened doors in large demand. Opportunity for next season to secure agency new type screen. Fit any window or door for less. Large profits. Minimum investment $50.00. All territories. C. R. Parrish, 1526 Gordon Street, Atlanta, Ga.

ANTI-FREEZE! Mix and sell your own. No equipment needed. Big demand. Costs few cents per gallon. Noncorrosive, non-inflammable, slow evaporating. Has high boiling point. Hurry! Instructions $1.00. Monroe-Methods, Box 3343, St. Paul, Minn.

MAKE Artificial marble, glazed tiles, uncanny. Tabletops, plaques, floors, hones, novelties. Hard, fireproof, inexpensive, cement secrets. Brilliant tile and liquid rubber samples 3c. John H. Payn, 945 Grande Vista Avenue, Los Angeles, Calif.

MAN in each town to Plate Auto Parts, Reflectors, Bicycles, Fixtures, Mirrors, by late method. Simple plan of manufacturing at home starts you in good paying business. Free particulars and proofs. Gunmetal Co., Ave. A, Decatur, Ill.

COLOR Concrete with chemicals. Wishing-wells. Spin concrete pottery. Stucco—rock. Miniature Castles, Mills. Cold glaze. Marbling. Sample 10c. Hollywood CementCraft, 8528 Wonderland, Hollywood, California.

PROFIT with new products. Make, sell, repeat. Analysis. Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, CE-1142 Sunnyside, Chicago.

MANUFACTURE from Phospholene. Cleaning fluid 1c gallon; bleach 2c gallon; hand soap 2c pound; and ten fast sellers. Sample 25c. Details free. Western, 6614 Denison Ave., Cleveland, O.

BELTS, men's, women's, make 'm and make money. Ideal Christmas gifts. We supply materials. Sample 25c. Art Leather, 400 Joseph Ave., Rochester, N. Y.

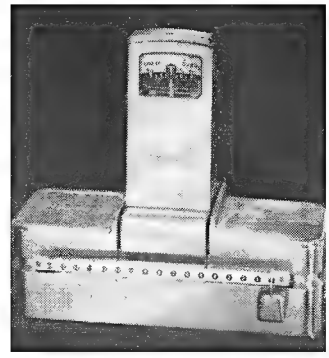
AFTERNOONS free for outdoors, movies. $340 month, home. Unique plan. No canvassing. Prepare for surprise. Folio-S, Station D, Los Angeles.

SUCCEED With Your Products. Make—Sell Them. Formulas. Processes. Accurate, detailed analyses. Catalog free. A. Thaxly Co., Washington, D. C.

YOU'LL Like Casting Liquid Marble Stationary. Enormous profit. Guaranteed success. Dime brings proof. Cole's, 348 Hayward Ave., Rochester, N. Y.

IF YOU have some spare room where you can do light work, see our offer on Page 30. Metal Cast Products Co., 1696 Boston Road, New York City.

New Scale Has Quick-Stop Arrow Indicator



This new lightweight scale is sensitive and accurate to 1 64 of an ounce and features a quick-stop arrow indicator, controlled by a hydraulic shock absorber. The etched, stainless steel beam, with special figures and graduations, is notched at each graduation for fast, accurate poise setting.

INVESTIGATE. Practical Ways to Earn More Money. Full or Spare Time. Interesting Literature Free. Write: H. Frerichs, Hartington, Nebr.

YOU'LL Like Resilvering Mirrors, Autoparts, Reflectors, Making Chipped Glass Signs. Write Sprinkle, Plater., 845, Marion, Indiana.

FOR an extremely profitable lifetime business, operate a Collection-Credit Agency. Free folder. Cole Associates, Syracuse, N. Y.

START You In Business. Popcorn Machines, Potato Chip Machines. Long Eakins, 2043 High St., Springfield, Ohio.

AGENTS—To mail our literature. Good profits. Home business. M. Maywood, 149 Fifth Ave., New York.

SELL by Mail! Books, Novelties! Bargains! Big profits! Particulars Free! H. Elfco, 438 North Wells, Chicago.

"RESULT Getter", magazine of money making opportunities. Copy 10c. C. Fenner, 1618 Lucia, Louisville, Ky.

RECAST old Batteries into new. Latest achievements. Battery Laboratories, St. Paul, Minn.

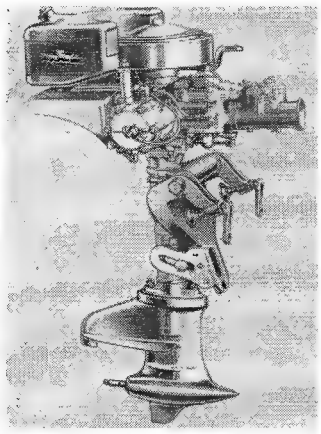
HOW and where to obtain capital fully explained, free particulars. Star Service, Wapakoneta, Ohio.

CAMERAS & PHOTO SUPPLIES

CAMERAS and supplies. Free illustrated catalog listing everything photographic—still and movie cameras, films and lenses—at tremendous savings. Hundreds of bargains, new and used. All guaranteed. We take your old camera or equipment in trade. Write now for your free copy of our newest money-saving bargain book—just out! Limited edition. Hurry! Central Camera Co. (Photographic Headquarters Since 1899), 230 South Wabash, Dept. 12-J, Chicago.

AMATEUR Photographers! Learn how to get the most out of your camera and dark room at great saving. Send for PHOTOGRAPHY HANDBOOK, new 144-page complete photo manual for only 50 cents. Send stamps, check, money order to Fawcett Publications, Dept. C-1, Greenwich, Conn.

New Class B Engine



The cylinders of this new Class B outboard engine are cast individually of close-grained nickel-iron, bored and ground to exact dimensions and smooth finish. Cylinder heads are cast in two pieces of new and special alloy of detachable design to permit perfect machining of cylinder bores. Copper inner head has an aluminum water jacket.

MAKE money in photography. Learn quickly at home. Spare or full time. Easy plan. Previous experience unnecessary. Common school education sufficient. Interesting booklet and requirements free. American School of Photography, 3601 Michigan Ave., Dept. 2048, Chicago.

NO MORE wasted film or unnecessary expense. Take pictures you can be proud of. Sell to magazines and newspapers. Make good money wherever you live. Easy, low-cost home study course shows you how! Free Catalog. Universal Photographers, Dept. A, 10 W. 33 St., New York City.

MAKE Money Selling Snapshots—Dime brings hundred-page book, complete instructions, buyers, real information. Lyons-Publishers, 402-M Evans Building, Washington, D. C.

THREE filters for $1.00, yellow, red, and green with hard fibre frames and adjustable springs for lenses up to 1¼ inches in diameter. Kay Photo Supplies, Box 51A, Cicero, Ill.

DUPONT Superior panchromatic, guaranteed 35 mm twenty-five foot roll $1.00. Optical Development Corp., 1560 Broadway, New York.

CARTOONING

CARTOONING, lettering, etc. 46 lessons, 600 illustrations, including practice sheets, pens, pencils. Drawings criticized. $1.00 complete. Allen Art Service, 1799 E. 100th, Cleveland, Ohio.

CHARTERS

DELAWARE Charters: Complete incorporating and organizing service $35. Submitted forms. Chas. G. Guyer, Inc., Wilmington, Delaware.

CHEMISTRY

CHEMISTRY, Mineralogy, Microscopes, Telescopes, Binoculars. Catalog Free. Tracey Laboratories, Evanston, Illinois.

JOIN American Amateur Chemists Society. Founded 1931. Journal, Particulars 10c. Haslett, Michigan.

DETECTIVES

DETECTIVES. Make Secret Investigations. Experience unnecessary. Detective Particulars Free. Write, George Wagner, 2640-V Broadway, N. Y.

EDUCATIONAL & INSTRUCTION

WATCH-REPAIRING is steady profitable work. Experts always in demand. You can learn watchmaking trade at home, spare time. New original instruction system. Script Engraving course included. Write for Free Details today! Nelson Co., W-2038 Manhattan Building, Chicago.

MEN Wanted—Learn Tool & Die Making. Automatic Screw Machine. Machinist Trade. Big Demand. Actual Experience. Expert Supervision. Write for Free Book "M." Allied Screw Machine Co., Inc., School Div., 603-9 Lake St., Chicago.

ELECTRICAL EXPERIMENTS

ELECTRICAL Arc Experimental Kit! Make powerful searchlight—melt glass, copper, iron—generate suntan rays, dozens others. Complete with power reducer, goggles, carbons, instructions. 110-volt. Postpaid $1.99. Electrical Salvage Co., Box 524-112C, Lincoln, Nebr.

ELECTRICAL SUPPLIES

ELECTRICAL experimenter supplies, magnet wire, insulating materials, etc. Send 10c for complete catalog. Autopower, 412 So. Hoyne Avenue, Chicago.

ELECTRIC EYE

ELECTRIC eye burglar alarms, door signals, hundreds ideas; reprint "Electric Eyes: A New Industry," also catalog, wiring diagram, 25c. Photobell, Dept. 75, 96 Warren, N. Y.

ELECTRIC PENCIL

ELECTRO-SCRIBE: Electric Pencil Writes—Engraves all Metals. $1.00 postpaid. Details. Beyer Mfg. Co., 4515-Y Cottage Grove, Chicago.

ENGINES, MOTORS, ETC.

MOTOR Winding lessons, illustrated. Send stamp for particulars. Motor Data Service, Box 7631, Kansas City, Missouri.

FARM ELECTRIFICATION

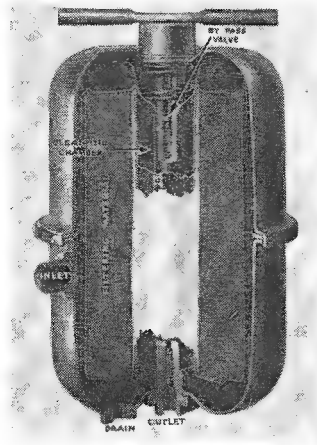
FREE—Complete detailed methods for practical, unbelievable-low cost farm electrification. Kubat Mfg. St. Paul, Minnesota.

FOR INVENTORS

PATENTS—Before too heavy an outlay of time or money is made on an invention, a search of the Patent Office records should be made to determine as nearly as possible whether or not the same idea has been patented before. The cost of this search is small, while the value of the facts it uncovers is often considerable. We offer inventors and manufacturers a thorough, prompt, confidential search service—plus experienced counsel and assistance in every phase of Patent and Trade-Mark practice. Write for our new free book containing valuable information relating to patent procedure. Clarence A. O'Brien and Hyman Berman, Registered Patent Attorneys, 28-F Adams Bldg., Washington, D. C.

INVENTORS: Send for my free 72-page book. Conscientious, prompt personal service on all patent matters. Registered Patent Attorney, L. F. Randolph, Dept. 341, Washington, D. C.

New Oil Filter Gives Greater Oil Mileage



This new oil filter not only conserves oil consumption but it cleans and maintains the original color of the oil. It removes dirt and sludge and re-conditions the old oil, which helps to eliminate the need for frequent oil changes.

WE SUCCESSFULLY sell inventions, patented and unpatented. Write for proof, and tell us what you have for sale. Chartered Institute of American Inventors, Dept. 5-B, Washington, D. C.

FORMULAS, PLANS, ETC.

ANALYSIS. Research. Newest guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chemists, CE-1142 Sunnyside, Chicago.

SUCCEED With Your Products. Make—Sell Them. Formulas. Processes. Accurate, detailed analyses. Catalog free. A. Thaxly Co., Washington, D. C.

FORMULAS. Latest Money Makers. Literature free. D-Belfort, 4042 N. Keeler, Chicago.

50c BRINGS 10 Selected Guaranteed Formulas. Reliance Novelty Co. North Emporia, Va.

FORMULAS—All kinds. Guaranteed. Catalog Free. Kemico, 67, Parkridge, Illinois.

FOR SALE OR EXCHANGE

WATCHES bought, sold, exchanged. List Free. Wm. Jauvrin, Ludlow, S. D.

HOME CRAFTSMAN

HOUSEHOLD Grindstone 10 inch: Steel spindle and crank; simple bearings, $3.50 plus parcel postage. Sharpens tempered steel without heating. Hoppen, Newark, N. J.

BEAUTIFY your old furniture! Refinishing now made easy. Complete instructions 35c. Todd's Service, 262 Arlington, Youngstown, Ohio.

HYPNOTISM

HYPNOTISM. Complete 20 Method Course 25c. Western Institute Hypnotism, MM-2984 North Ridgeway, Chicago.

INVENTIONS

INVENTORS: Sell your unpatented invention with positive safeguards under patent laws. New low-cost procedure. Complete details, free. American Patents Corporation, Dept. 5-E, Washington, D. C.

INVENTIONS Commercialized. Patented or unpatented. Write Adam Fisher Co., 582 Enright, St. Louis, Mo.

INVENTIONS Bought, sold. Patented, unpatented. James Wallace, Homer, N. Y.

INVENTIONS WANTED

SMALL Inventions Wanted by Manufacturers. I'll help you sell your invention. Write for free circular. S. Hull, 7829-L Euclid Avenue, Cleveland, Ohio.

WANTED—Meritorious patented, unpatented inventions. Booklet free. Invention Reporter, 4B-11236 South Fairfield, Chicago.

INVENTORS

WE LOCATE Buyers meritorious patented, unpatented inventions. If would accept reasonable cash or royalty, write Invention Reporter, 4A-11236 South Fairfield, Chicago. Booklet free.

GET Your Own Patents. Legal blanks, complete instructions $1. Cudding Sons, Campbell, California.

MACHINERY, TOOLS & SUPPLIES

HEADQUARTERS for Home Craftsman Machinery and Equipment—bought and sold. Lathes, cutters, scroll saws, etc. If you want to sell, get our offer first; if you want to buy, send for bargain price list. Craftsman House, 315-D Harding St., Avoca, Penna.

6 VOLT D.C. Pumps for liquid, air, vacuum, pressure, $3.95. Erwin, 5111 Fletcher, Chicago, Ill.

MAGIC TRICKS & NOVELTIES

FREE! Magic Catalog 500 tricks Amaze. Mystify friends. Write today! Lyle Douglas, Station A-3, Dallas, Texas.

WE SUPPLY every noted magician. Large Professional catalog 25c. Holden, 222 West 42nd St., New York.

MALE HELP WANTED

AMAZING invention closes all doors silently, automatically. New oil principle. Easily installed. Never needs attention. Priced dollars less than other checks. Unlimited market, stores, offices, factories. Free demonstrator furnished workers. Kant-Slam, Dept. F-63, Bloomfield, Indiana.

AT HOME—Your own manufacturing business, making popular $1.00 novelties. Cost you 3c to 15c. Everything supplied. Write So-Lo Works, Dept. M-843, Cincinnati, Ohio.

MALE & FEMALE HELP WANTED

M. M. EARNED $267, three weeks, raising mushrooms in cellar! Exceptional, but your cellar, shed perhaps suitable. We buy crops. Book free. United, 3848 Lincoln Ave., Dept. 89, Chicago.

MIDGET AUTOMOBILES

BUILD a Midget Miller Racer. Complete plans for constructing this authentic midget automobile appear in the new 1938 edition of How-To-Build-It along with many other interesting home and workshop plans. Send 50c for this 144-page book to Fawcett Publications, Inc., Greenwich, Conn.

MIDGETS! Plans, parts, kits. Catalog-handbook, 10c. Latest lists 100 used motors, midgets, parts, 20c. Details free. Shipps Midgets, Box 543-B, Zanesville, Ohio.

MIMEOGRAPHING, MULTIGRAPHING

LETTERS Composed $2.00—Mimeographed 75c per 100—Multigraphed $1.30—by Letter Specialist, 300 B-st., S.E., Washington, D. C.

MISCELLANEOUS

HOBBY—grow flowers, vegetables in solution tanks. No soil. Heavy yields. $1 directions and complete chemicals sufficient fifty gallons solution. Box 255, Killarney, Florida.

BURIED TREASURE, Minerals, free booklet, photographs. Fisher, Palmer Bldg., Hollywood.

MODEL RAILROADING

BUILD a Model Railroad in 00 gauge (¾ inch between rails). A complete catalogue of parts, construction kits, and completed units. One Dime. Nason Railways, P. O. Box 9, Mt. Vernon, N. Y., Dept. 12X.

MODEL Railroad Supplies "O" Gauge (¼" scale—1¼" between rails) Freight Car Body Kits $1.00, Illustrated Catalog 10c. Westbrook Co., Hasbrouck Heights, New Jersey.

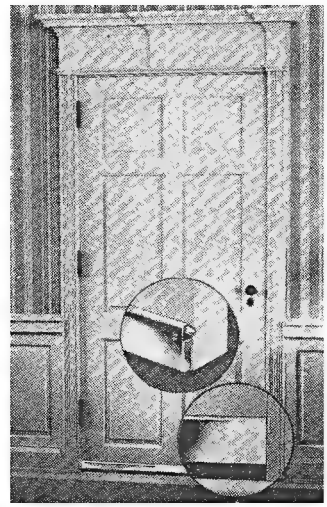
MODELS & MODEL SUPPLIES

YOUR Ideas developed into practical working model. 30 years successful experience; thousands satisfied customers. Confidential service guaranteed. Bank references. Send 3c postage for 32 page book "Making Inventions Pay." Crescent Tool Company, Dept. T, Cincinnati, Ohio.

MONEY MAKING OPPORTUNITIES

M. M. EARNED $267, three weeks, raising mushrooms in cellar! Exceptional, but your cellar, shed perhaps suitable. We buy crops. Book free. United, 3848 Lincoln Ave., Dept. 90, Chicago.

New Device Ends Under-Door Drafts



A new device simple in design and effective in operation, stops all under-door drafts and can be attached to any existing door. It works automatically. When the door is closed, a concealed shield springs down, completely shielding all space between the bottom of the door and the floor. The photograph shows the position of the shield when the door is open and closed.

MOTION PICTURE & SOUND EQUIPMENT

USED Bargains: 400' 16mm reel & can 35c; 1600'—$1.39; with can—$2.09. Victor 16mm camera f3.5 $34.75. Capital Continuous 16mm projector 400', 500w with translucent screen $45.00. Moviematic camera $2.89, film 88c. 35mm DeVry, regular $675.00, sound film projector, amplifier, speaker, complete for use $185.00. Home Talkie Turntable outfit, new, complete $7.85. 16mm 100' comedies, etc., $1.25, 400' $6.50; Sound $10.00. Features $65.00. Religious. Rental Films 8-16mm sent anywhere. Lowest rates. Catalogue. Largest variety Photographic, Movie Equipment. Trades accepted, bought. Megull's, 70 West 48th, New York.

MOVIE Films 8mm—16mm. Reduced prices. Free list. Crown Film Corp., C-42 Melrose St., Boston, Mass.

16-35 M.M. SILENT Films List 5c. Bednar, 5300 S. Talman, Chicago.

MOTORCYCLES

RECONDITIONED Motorcycles. New —used parts for all makes. Authorized Harley-Davidson Dealer. Whitman Motorcycle & Supply Co., 405-9 Southwest Blvd., Kansas City, Mo.

SEND 15c for illustrated used Motorcycle catalog. Bargains. Largest stock genuine Indian parts and motorcycles. Indian Motorcycle Sales, Kansas City, Mo.

OFFICE EQUIPMENT

TYPEWRITERS, multigraphs, addressing machines, adders, dictaphones, duplicators, sealers, folders. Save half. Write Pruitt, 553 Pruitt Bldg., Chicago.

PATENT ATTORNEYS

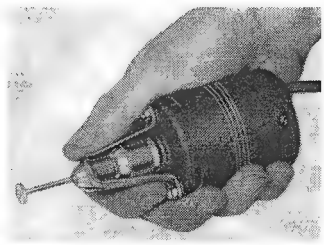
PATENTS—Before too heavy an outlay of time or money is made on an invention, a search of the Patent Office records should be made to determine as nearly as possible whether or not the same idea has been patented before. The cost of this search is small, while the value of the facts it uncovers is often considerable. We offer inventors and manufacturers a thorough, prompt, confidential search service—plus experienced counsel and assistance in every phase of Patent and Trade-Mark practice. Write for our new free book containing valuable information relating to patent procedure. Clarence A. O'Brien and Hyman Berman, Registered Patent Attorneys, 28-F Adams Bldg., Washington, D. C.

PATENT Your Idea. Write immediately for two free books, "Patent Protection" and "When and How to Sell an Invention." Fully explain many interesting points to inventors and illustrate important mechanical principles. With books we also send "Evidence of Invention" form. Prompt service, reasonable fees, thirty-nine years' experience. Avoid risk of delay. Address: Victor J. Evans & Co., Registered Patent Attorneys, 41-P Victor Building, Washington, D. C.

PATENTS. Send sketch, photos or model and description of your invention for preliminary search and patentability report. Total expenses, including search fee, for preparing, filing and prosecuting your application quoted before you proceed. Rates Reasonable. Prompt and efficient services. Lynwood B. James, Registered Patent Attorney. Established 1913, Suite 843-C National Press Building, Washington, D. C.

PATENTS. Booklet free. Highest references. Best results. Reasonable fees. Watson E. Coleman, Victor Building, Washington, D. C.

Electric Grinder Aids Model Makers



This small grinder is shaped to fit the hand and give maximum tool clearance and visibility at the point of work at all angles of application. The guide finger support permits gripping well forward of the collet, a feature that increases both power and accuracy in grinding, routing, touching up or cutting.

FREE books tell all! What to do with your invention? Patent facts clearly explained. 63 years' experience at your immediate service on easy budget payment plan. Write today for free copies of interesting booklets and "Certification of Invention" form. C. A. Snow & Co., 3125 Snow Building, Washington, D. C.

INVENTORS—Before disclosing your invention to anyone send for Form "Evidence of Conception"; "Schedule of Government and Attorneys' Fees" and instructions. Sent free. Lancaster, Allwine & Rommel, 426 Bowen Building, Washington, D. C.

"INVENTOR'S Guidebook" containing 96 mechanical movements and advice about patenting, selling inventions, also "Record of Invention", Free. Frank A. Ledermann, Patent Attorney-Engineer, 154 Nassau Street, New York.

HAVE YOU a sound, practical invention for sale, patented or unpatented? If so, write Chartered Institute of American Inventors, Dept. 5-A, Washington, D. C.

PATENTS

INVENTIONS Commercialized. Patented or unpatented. Write Adam Fisher Co., 582 Enright, St. Louis, Mo.

PHONOGRAPHS

PHONOGRAPHS, Parts, Supplies. Portables $4.95. Records 6c. Epstein's, 50 First St., New York, N. Y.

PHOTO DEVELOPING

FINER Finishing. Rolls developed and printed, with One Colored enlargement, or two professional enlargements. All for 25c (coin). Genuine. Nationally Known, Moentone Superior Quality. Moen Photo Service, La Crosse, Wis.

SIXTEEN sparkling prints, 2 Hollywood style enlargements with roll developed —25c. 20 Reprints 25c; 100, $1.00. Photographic Christmas cards—10 for 49c; sample, 5c. Lifetone Studios, A-27, Des Moines, Iowa.

"STREAMLINE PHOTOS" New! Different! Rolls developed, printed. Free Xmas Card from best picture 25c. Free enlargement coupon. Streamline Studios, Box 5699 R, Cleveland, Ohio.

TWO Beautiful Enlargements, eight electrogloss prints with roll developed 25c. Mayfair, Dept. A1, Box 261, Toledo, Ohio.

PERSONAL Photographic Christmas Cards, Calendars. Illustrated Circular Free. Ideal Photos, Box 2255, Paterson, N. J.

ROLLS Developed—8 Larjaprints (enlargements) 35c or 8 regular prints 25c. Star Photo, New Britain, Connecticut.

POULTRY

MAKE Money With Poultry. Read America's leading poultry magazine for latest information. Three years $1.00; nine months 25c. Poultry Tribune, Dept. C-94, Mount Morris, Illinois.

PRINTING

125 LETTERHEADS 8½x11 and 125 Envelopes—$1.00 postpaid. Benneville, 907 West Roosevelt, Philadelphia.

RADIOS

PLANS 18 Distance Crystal Sets—SW record 4,250 miles, with "Radiobuilder" year—25c. Laboratories, 7700 -K East 14th, Oakland, Calif.

RADIO & TELEGRAPHY

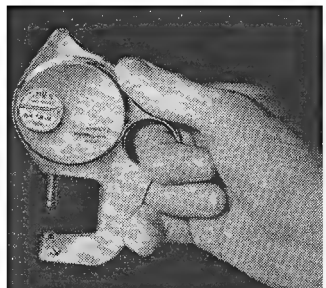
RADIO BUILDERS' MANUAL—A book of radio set building plans and kinks for the home experimenter. Everything from a crystal set to a powerful 6-tube auto radio is included. Price 50 cents—order directly from Fawcett Publications, Inc., Fawcett Bldg., Greenwich, Conn.

RADIO Engineering, broadcasting, aviation and police radio, Servicing, Marine and Morse Telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, King St., Valparaiso, Ind.

SALESMEN WANTED

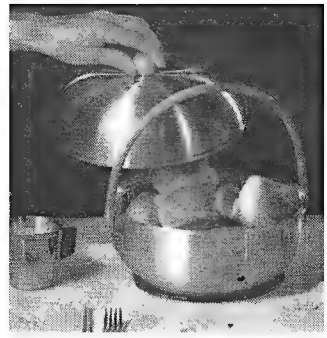
BIG MONEY taking orders; Shirts, Ties, Hosiery, Underwear, Raincoats, Pants, Dresses, etc. Sales Equipment Free! Experience unnecessary. Write Nimrod, 4922-AR Lincoln, Chicago.

Pocket Gauge Checks Material Thickness



Small enough to fit in a vest pocket, a new gauge measures the thickness of any material up to an inch in 64ths, 32ds, 8ths, and larger fractions of an inch. An operating wheel at the top causes the spindle and upper anvil to raise or lower and the dial to register the measurement. The manufacturer states that the gauge is accurate enough to check sizes of work-in-process and finished goods.

New Server Keeps Biscuits Piping Hot



Piping hot from range to table is a feature of this new hot biscuit server. It is designed for crisping when the air vent is open and for refreshing dry foods when the air vent is closed. The lower section can also be used as a fruit, salad or flower bowl.

ATLAS Window Sign letters. Large Sizes, Penny Each. Beautiful Free Samples. Atlas, 7941-G Halsted, Chicago.

SPECTROSCOPES

SPECTROSCOPE quickest way to analyze chemicals, ores $2.50. Cudding Sons, Campbell, California.

TATTOOING SUPPLIES

TATTOOING Outfits, Supplies, Remover, Bargain List. Waters, M-965 Putnam, Detroit.

TELESCOPES, MICROSCOPES, ETC.

TELESCOPES, Microscopes, Binoculars; 1938 bargain catalog free. Brownscope Company, 5 West 27th Street, New York.

BUILD reflecting telescope 6" kit $3.50. Instructions 10c. catalog free. Optical Development Corp., 1560 Broadway, New York.

CHEMISTRY, Mineralogy, Microscopes, Telescopes. Binoculars. Catalog Free. Tracey Laboratories, Evanston, Illinois.

VENTRILOQUISM

LEARN Ventriloquism by mail; small cost, 3c stamp brings particulars. Geo. W. Smith, 125 North Jefferson, Room S728, Peoria, Ill.

VIOLET RAY LAMP

ULTRA Violet-Infra Red. Dual Ray Health Lamp. Two separate units in one. Promotes Sun Tan—Vitamin "D." Automatic control. AC-DC current. $3.90 postpaid. Details. Beyer Mfg. Co., 4515-M Cottage Grove, Chicago.

WELDING

D.C. ARC-WELDER Plans $1.00 each. (Positively no armature winding.) Delco plan: 25-200 amperes from 32 volt Delco farm light plant. Heavy duty plan: 25-600 amperes from d.c. truck motors. Dodge plan: 25-200 amperes from North-east (Dodge) 12 volt automobile generators. Welders Club of America, BB-3432 M-Mart, Chicago. Special: D.C. truck motors, new and used, for sale.

Radioactive Element Traced Through Body

Potassium, one of the vitally necessary chemical elements, can now be traced in its course through the body by making it radioactive in an atom-smashing machine, or cyclotron. First results of a research project using this technique have been reported by a group of physiologists at the medical school of the University of California.

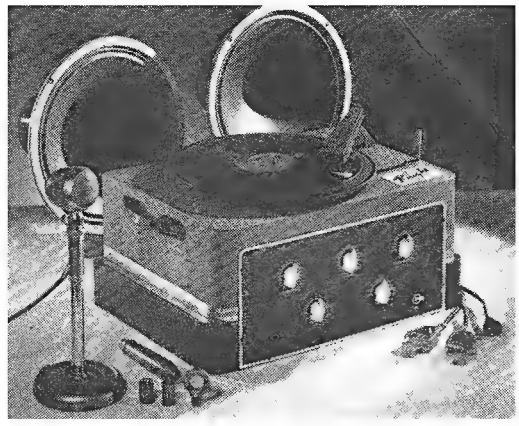
Rats were used in the experiments. They were given food containing the artificially radioactive potassium, and its presence later detected with suitable physical instruments. The experimenters report that:

"The absorption of potassium from the gastro-intestinal tract is very rapid . . . about 90 per cent being absorbed within half an hour. Some of the absorbed potassium is very quickly rejected, mainly through the kidneys. The major portion is retained and taken up by the muscles and other soft tissues of the body."

The research team at work on the problem consists of Drs. David M. Greenberg, Michael Joseph, Waldo E. Cohn, and Elma V. Tufts.

Craftsman or just a casual reader, you'll find MECHANIX ILLUSTRATED entertaining and instructive EVERY issue.

New Sound System Operates On Battery, House Current



A newly developed sound system can be operated from an automobile's regular six-volt storage battery or from 110-volt A. C. house current. Featuring dual microphone input, phono input and individual bass and treble tone controls, the system is supplied complete with two giant speakers and a microphone. The system's circuit provides 25 watts of audio power.

ADLETS FOR HOBBYISTS

(See regular classified section for rates and other information.)

STAMPS

GENEROUS Offer! Triangles from three countries, Tanganyika, Newfoundland Commemorative, Giant Map, U. S. $5., scarce Manchukuo—27 different, Plus Spanish War Commemorative Set. Everything 10c offered approval applicants. Tru-Value, M1412, Hartford, Connecticut.

FREE Stamp Catalogue: George VI Issue—Giant forty-page quarterly listing Albums, Supplies, Coronations, Canadians, Colonials, United States and foreign. Illustrations galore! Empire Stamp Co., Dept. MM., Toronto, Canada.

NEW Rivera nude stamp! World's largest triangle! Congo, Sudan, South Seas, bicolors, pictorials and many others. Only 3c with approvals. Cactus Junior Approvals, Box 1870-D, Tucson, Arizona.

DESIRABLE Imperforate Miniature Sheet of Four Triangular Stamps (extremely limited issue) with 50 different World Collection, only 10c. Friendly Filatelists, Box 4428M, Philadelphia, Penna.

1897 GRANDE Comore, Kouangtcheouwan, Caymans, Liberian Bongo, Turks Caicos, huge Bhopal Triangle, etc. Everything 3c with approvals. Viking, 1-R Hanson Place, Brooklyn, N. Y.

PRODIGIOUS GIFT! Bicolored Banana Airmail, Perak, Selangor, Fantastic Indochina, Sembilan, Siberia, Free with Approvals! Postage 3c. Saxon, 435 Fulton St., Brooklyn, N. Y.

STAMPS! 100 diff. 3c; 500 diff. 35c; 1,000 diff. 90c! Illustrated Album (4000 spaces) 22c. Approvals sent. Tatham Stamp Co. (D9) Springfield, Mass.

CORONATIONS and Jubilees in packet of 54 Different British Colonies 10c with approvals. Swedell, 3038 Harriet Ave., Minneapolis, Minn.

UNITED STATES—45 Different, Perforation Gauge, Hinges, Bargain Price List—all for 10c. Seidenberg, Baroda, Mich.

BRITISH Colonics included—Forty Country Mixture—100 stamps, 10c; 300, 25c. No approvals. Guy Elsea, Bowling Green, Ohio.

200 COMMEMORATIVE and obsolete United States postage (over 75 different), $1.00. Waldo, Box 266, Dallas, Texas.

FREE!!! Two Coronation Sets. Postage 3c. Roberts, 312T Shearerbldg, Baycity, Michigan.

COINS

COINS, Beadwork, Indian Relics, Minerals, Old Glass, Books, Curios, Stamps. Catalogue, 5c. Indian Museum, Northbranch, Kansas.

FREE: Foreign Coin, Banknote and Large Illustrated coin catalogue, for 4c postage. Approvals sent. Tatham Coinco, Springfield-9, Mass.

COINS FOR SALE

COMMEMORATIVE Half Dollars, Lincoln, Stone Mountain, Oregon, Texas, Cleveland, Kentucky, San Diego, Long Island, $1.50 each. Illustrated Catalogue No. 14, 25c. Norman Shultz, Salt Lake, Utah.

INDIAN CURIOS

INDIAN CURIOS. 100 good ancient Arrowheads $3.00. Tomahawk Head 50c. Illustrated catalog 5c. H. Daniel, Hot Springs, Arkansas.

AUTOMOBILE PHOTOS

PHOTOGRAPHS, World's Costliest, Speediest Automobiles, Duesenberg, Hispano, Isotta, Maybach, Lagonda, etc. Dozen, $1.00. Handbook, 10c. Automobiles. Box 584, Saint Cloud, Minnesota.

OLD STAMPS AND ENVELOPES WANTED

WILL pay $85.00 for 1924 1c green Franklin stamp, rotary perforated eleven ($1,000.00 if unused). Send 6c today for Large Illustrated Folder showing Amazing Prices Paid for Old Stamps and Envelopes. Vernon Baker, 444-MM-12, Elyria, Ohio.

NO OTHER magazine is so different, so absorbingly entertaining, that it can say to readers:

"GUARANTEED! If this isn't the best quarter's worth you ever read, get your money back!"

It's a daring experiment, but ***true*** is ready to stand back of its guarantee to the limit—your money back if you're dissatisfied!

Expert writers, newspaper reporters, adventurers and travelers contribute to ***true***. The far-flung resources of every photographic service in America help to make it the best illustrated, most thrilling magazine in the world ... and we *guarantee* you'll like it!

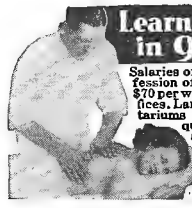
25c

true

Learn TO MOUNT BIRDS

TAN SKINS, MAKE UP FURS
Be a Taxidermist. We teach you **at Home.** Mount **Birds, Animals, Pets,** common specimens. Save your hunting trophies; decorate home and den. Make genuine **KROME LEATHER,** tan and make up furs for spare-time profit. **INVESTIGATE TODAY.**
FREE BOOK 48 pages-tells all about it. Hunters, get your copy **It's Now Free.** Send post card. State your **AGE.**
N. W. School of Taxidermy, 9739 Elwood Bldg., Omaha, Nebr.

FREE TRAILER PARTS CATALOG
New Catalog FREE! Axle bargains. Straight, square axles for Fords, Chevrolets, etc., $4. Drop axles, $7 up. Under-carriage with axle, hubs, bearings, wheels, springs and fittings, $19.50. **BRAKES:** Cable-controlled, $15. Booster and car control, $19.95. Electric brakes—prices on request.
Shamrock Trailer Parts, 12319 Turner, Detroit, Mich.



Learn Profitable Profession in 90 days at Home
Salaries of Men and Women in the fascinating profession of Swedish Massage run as high as $40 to $70 per week but many prefer to open their own offices. Large incomes from Doctors, hospitals, sanitariums and private patients come to those who qualify through our training. Reducing alone offers rich rewards for specialists. **Write for Anatomy Charts, and booklet—They're FREE.**
THE College of Swedish Massage
1601 Warren Blvd. Dept. 358, Chicago
(Successor to National College of Massage)

MAN IN EACH TOWN
To Plate Auto Parts
Reflectors, Bicycles, Fixtures, Mirrors, by late method. Simple plan of manufacturing at home starts you IN GOOD PAYING BUSINESS. Write today for FREE particulars and proofs.
GUNMETAL CO.,
Ave. P. Decatur, Ill.

CARTOON YOUR WAY TO SUCCESS!

DON'T COPY - LEARN TO ORIGINATE!
RAYE BURNS will teach you HOW to CREATE ORIGINAL CARTOONS at home that you can SELL! Course has 26 lessons and 600 illustrations. *Send name and address for free details.* Only.... **$2.85**
RAYE BURNS SCHOOL, Dept. F, Box 2194, Cleveland, Ohio

LEARN WATCH REPAIRING

AT HOME You can learn by our modern and original system of instruction every part of the **Watch repairing Trade at home.** You can earn money while learning and prepare yourself for a well paying position or start in business after completing our course of instruction. Good watch repairers are in demand and generally earn very good salaries. For particulars apply to the
WISCONSIN SCHOOL OF WATCH REPAIRING
524 E. Mason St., Dept. C, Milwaukee, Wis.

Want a Career in photography?
Profit by the growing demand for photographs. Big money-making opportunities in Commercial, News, Portrait, Advertising, Natural Color, Motion Picture, and other branches of photography. Personal Attendance and Home Study Courses. 28th year. Free booklet.
NEW YORK INSTITUTE OF PHOTOGRAPHY
10 West 33 Street (Dept. 153) New York City

Small Motor Solves Glider Launching Problem

A powered glider, equipped with a low-power, lightweight engine in the same manner as a sailboat fitted with an auxiliary motor, has been devised by Peter Riedel, German glider enthusiast and winner of last year's U. S. Soaring Contest, as the answer to the sailplane's biggest difficulty—getting off the ground.

A Motor-Condor glider built by Riedel in Germany enabled the noted sailplane enthusiast to get off the ground without the assistance of all the friends he could muster, he reports in the current issue of *Soaring*.

The experimental installation made by Mr. Riedel weighed but 110 pounds, he reveals. Proper design—placing the motor in the fuselage, mounting the propeller on a streamlined mast—need not interfere with the plane's flight despite the added weight, he finds.

Sailplane pilots at present face troublesome difficulties each time they decide to take their ships up for a spin in the air currents. They must either get a pilot to tow them up or have a friend tow them behind a car. If the airport is not well located from the point of view of available rising air currents, they must reach such a point. Then, when the day's soaring is done, the plane comes to rest at a point many miles distant from the starting place. Someone must wait all that time at the starting point to receive a landing report and then dash to the landing place to pick up sailplane and pilot.

A powered glider would solve these difficulties, Mr. Riedel holds. Such a solution is essential to the spread of the sailplane vogue.

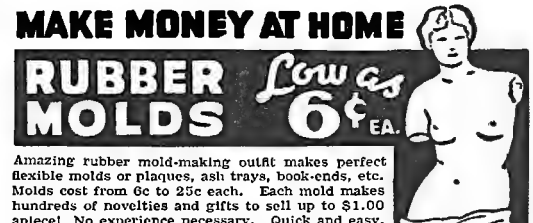
For contest purposes, officials might limit the amount of gasoline carried by the plant sufficient to get it to the height up to which tows are now permitted, he points out. Besides that, the plane's barograph would record the vibrations of the motor and in that way it would be known when the motor was shut off.

The experimental plane flown by Mr. Riedel took off in 325 feet and climbed quite satisfactorily. Proper improvements would cut take-off distance to 230 feet.

A three or four-cylinder engine mounted in the fuselage of a plane with a 60-foot wingspan is the proper type of power glider, the glider champion feels. A retractable landing gear is essential for maneuverability around the airport. The power glider is also convenient because it can make its own way back to the airport.

When you complete a how-to-build project, why not send a photo and description of it to the Editor's Workbench department? Perhaps you will be awarded one of the many cash prizes offered by MECHANIX ILLUSTRATED each month. (See page 12).

Save ON EVERYTHING IN RADIO!
Send for ALLIED'S 1939 CATALOG
SETS! PARTS! KITS!
AT LOWEST PRICES
Send NOW for ALLIED'S new 1939 Radio Catalog—it includes Everything in Radio in one great book! 62 new Knight Radios at amazingly low prices—$6.95 and up—4 to 16 tubes—new AC, DC, 1½ Volt, 6 Volt, and 32 Volt models; complete new line of phono-radios, record players, phonographs; new Build-Your-Own Kits—1, 2, and 3 Tube Jiggers', Photo Cell, 20 Watt Transmitter — over 100 diagrams and projects! Also, over 14,000 radio parts, Public Address Systems, Amateur Receivers and Transmitters, Test Equipment, books, tools, etc. They're all in ALLIED'S Catalog—at 1939's lowest prices!
FREE PARTS LISTS
We can supply Free Parts Lists covering any circuit described in any magazine construction article. Write!
EVERYTHING IN RADIO
ALLIED RADIO
FREE CATALOG
ALLIED Radio Corp., Dept. 6-M-9, 833 W. Jackson Blvd., Chicago, Ill.
☐ Send me your Free 1939 Catalog.
☐ Send me Parts List for_____.
Name _____
Address _____


MAKE MONEY AT HOME
RUBBER MOLDS
Low as 6¢ EA.
Amazing rubber mold-making outfit makes perfect flexible molds or plaques, ash trays, book-ends, etc. Molds cost from 6c to 25c each. Each mold makes hundreds of novelties and gifts to sell up to $1.00 apiece! No experience necessary. Quick and easy. Start profitable business in your home . . . sell to stores, gift shops, friends, resorts, road stands, by mail. Full or spare time. "Molders Handy Book" and list of buyers FREE. Write SO-LO WORKS, Dept. M-834, Cincinnati, Ohio.

Saw-Filing
Pays Dollars for Spare Time
No Experience Needed
A FOLEY Saw Filer files hand, circular and band saws better than the best hand filer. Cash business, no canvassing, no eye-strain. J. L. Newman, Louisiana, says: "I only use my Foley Filer for a side line, and I would say that I take in from $10.00 to $15.00 a week now." Send coupon for FREE PLAN, no obligation.
FOLEY MFG. CO., 1206-8 Foley Bldg., Minneapolis, Minn.
Send Free Plan on Saw Filing business.
Name _____
Address _____

JUST OUT! Don't miss this—see coupon below.

Wood workers:

Write NOW!

Here is Craftsman's New 1939 catalog No. 11—136 pages packed with facts—surprising special bargains in rare fancy woods. Be sure to write for this catalog at once.

136 Pages packed with FACTS

Only 10¢

New Ideas!

IF YOU are not now a woodworker, then learn this fascinating art: you can start with a $1.98 scroll saw outfit.

Later you can make tables, clocks, lamps, bookcases, etc., all articles of lasting value.

A wonderful hobby, it beats golf! A money maker for spare time.

Latest ideas in wood finishing, knacks and secrets explained.

Craftsman's new art Inlay process explained. (So easily learned.)

News about ply woods, startling price quotations, on rare woods from Africa, Australia, East India and elsewhere.

235 Brand New scroll saw patterns and 66 others, total 301. Do see these!

Complete list of American woods, cut without waste, at bargain prices; border strips, fancy timbers, legs, carved ornaments, etc.; all kinds of hardware, accessories, special glues, etc.; lists of books for wood workers, etc., etc., etc.

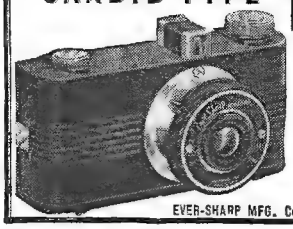
Much more than a mere catalog: a mine of latest information. Every woodworker needs it! Yet only 10c. **Write while the edition lasts!** (Mail the coupon today.)

THE CRAFTSMAN, 2749 South Mary St., Chicago
I enclose 10c for catalog No. 11.

Name .....
Please write plainly.

Address .....
Please write plainly.

CANDID TYPE



Ever-Sharp CAMERA

$2.25 ea. post-paid

The Camera all America has been waiting for. Now you can own this smart, efficient candid type camera at an immense saving, direct from one of the country's largest manufacturers. Precision Speed Lens. Beautiful Streamlined ebony black case, chromium trimmed. Extra film compartment. 36 exposures with one loading. Guaranteed. *Order yours direct from this Ad.*

EVER-SHARP MFG. Co. 104 W. North Av. Chicago, Ill.

New Amazing INVENTION!
ELECTROPLATES by BRUSH
EASY AS PAINTING!

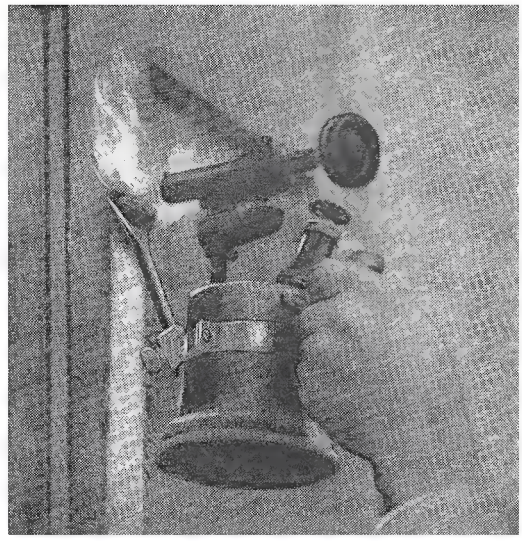
Easily..Expertly..Cheaply! SENSATIONAL new discovery actually electroplates. *It's easy* ...just brush it on. Deposits heavy, durable layer of metal by *electrolysis.* Results permanent—equal to beautiful work of costly tank outfits. *Non-liquid*—Portable—Battery or household current. Take it to the job. No dismantling ... plate where and what you want. Outfit in sturdy case, complete for instant use. Junior Battery Model: $6.85. *Heavy-Duty Professional Sets up to $27.50.*

Only $6.85

AGENTS WANTED: Write at once for Big Money Proposition. You can also make steady money plating for others.

WARNER ELECTRIC COMPANY, Dept. B-1
360 No. Michigan Avenue, CHICAGO, ILL.

Paint Scraper Device Holds Blade In Torch's Flame



Easily and quickly attached to a gasoline torch, as shown in photo, a newly developed device facilitates the removal of old paint. The device consists of a metal band which fastens around the torch, holding a scraper blade in front of the hot flame. With one stroke the old paint can be scraped off as it burns. Scraper blades of various sizes can be used.

Navy Divers Prove Merit Of New Decompression Method

Surface decompression can replace water-stage decompression for divers at certain depths. This important step forward in protecting divers against the "bends" is the outcome of recent research by the Experimental Diving Unit of the U. S. Navy.

By water-stage decompression is meant the standard slow ascent of a diver with certain stops for definite times on the ascending line. The object of this prescribed schedule is the prevention of compressed air illness, commonly known as the "bends."

For surface decompression the diver is immediately hauled to the surface and his helmet, shoes and belt removed as rapidly as possible. He enters a decompression chamber in the diving vessel and is recompressed to a level corresponding to the first stop under water. Decompression is then conducted as though on the ascending line.

This new method is not intended to replace water-stage decompression but is considered sufficiently safe as an emergency substitute down to a depth of 170 feet for a period of 30 minutes.

Radium Miners Near Arctic Circle Enjoy Home Comforts

Modern science, benefited directly by their activity, is providing miners at Canada's Great Bear Lake radium-bearing pitchblende mine with all the comforts of home despite the fact that the mine is but 40 miles south of the Artic Circle.

They get fresh vegetables in season—brought in 1,000 miles by plane from Edmonton, Alberta. They have steam heat. The mines in which they work are carefully wetted and sprayed to lay injurious dust. Electricity is provided by Diesel-powered generators.

These conveniences and methods in use at the mine, richest radium source in the world, were described before the American Institute by Dr. H. C. Parmelee, editor of Engineering and Mining Journal, who returned recently from a visit to the mine.

Operated by the Eldorado Gold Mines, Inc., a company headed by Gilbert La Bine, who discovered the pitchblende in May, 1930, the mine supplies the radium-bearing ore to a plant at Port Hope, Ont., which is producing a gram of precious radium salts a week and will soon be producing more.

Canada's farthest north mine is 1,400 miles by water from Waterways, terminus of a railroad connecting with Edmonton, Alberta's capital. The mine is 1,000 miles north of Edmonton in an air line. To meet the transport difficulties imposed by distance and the fact that waterways are open only three months a year, the company has organized an airline for handling mail, light freight and passengers.

Ore moves up river from the mine in the frozen fastness of Canada's north by means of steel power boats and barges. It is stored at Waterways until needed. Cost of moving the ore is now $40 a ton; when the mine was first begun it cost ten times as much to ship the same quantity.

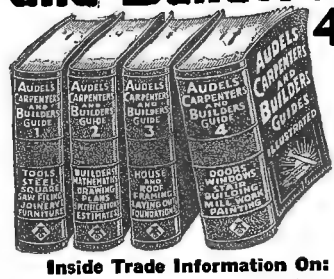
Two portages, one of eight miles and the other 16 miles in length, must be made in moving goods by water. This has led, in the case of the eight-mile carry, to the construction of a pipe-line for transshipping fuel oil required for the settlement's four Diesel engines.

The main ingredient in both hair and fingernails is the same—a substance called keratin.

The United States draws on practically every country of the world for its supplies of crude drugs.

When you complete a how-to-build project, why not send a photo and description of it to the Editor's Workbench department? Perhaps you will be awarded one of the many cash prizes offered by MECHANIX ILLUSTRATED each month. (See page 12).

AUDELS Carpenters and Builders Guides 4 vols. $6



Inside Trade Information for Carpenters, Builders, Joiners, Building Mechanics and all Woodworkers. These Guides give you the short-cut instructions that you want—including new methods, ideas, solutions, plans, systems and money saving suggestions. An easy progressive course for the apprentice and student. A practical daily helper and Quick Reference for the master worker. Carpenters everywhere are using these Guides as a Helping Hand to Easier Work, Better Work and Better Pay. To get this assistance for yourself, simply fill in and mail the FREE COUPON below.

Inside Trade Information On:

How to use the steel square—How to file and set saws—How to build furniture—How to use a mitre box—How to use the chalk line—How to use rules and scales—How to make joints—Carpenters arithmetic—Solving mensuration problems—Estimating strength of timbers—How to set girders and sills—How to frame houses and roofs—How to estimate costs—How to build houses, barns, garages, bungalows, etc.—How to read and draw plans—Drawing up specifications—How to excavate—How to use settings 12, 13 and 17 on the steel square—How to build hoists and scaffolds—skylights—How to build stairs—How to put on interior trim—How to hang doors—How to lath—lay floors—How to paint

THEO. AUDEL & CO., 49 W. 23rd St., New York City

Mail Audels Carpenters and Builders Guides, 4 vols., on 7 days' free trial. If O.K. I will remit $1 in 7 days, and $1 monthly until $6 is paid. Otherwise I will return them. No obligation unless I am satisfied.

Name.....

Address.....

Occupation.....

Reference..... MM12

HANDEE

TOOL OF 1001 USES

ACTUALLY A WHOLE SHOP FULL OF TOOLS IN ONE

Uses 200 different accessories, instantly interchangeable in easy-working chuck. For faster, better work on all materials, at home, in shop, or take to job. Plugs in any AC or DC socket, 110 volts. You'll be amazed at its unmatched performance, precision and almost human response.

Grinds
Drills
Polishes
Engraves
Sharpens
Carves
Cleans
Sands
Cuts
Saws

STANDARD MODEL

20,000 r.p.m. Weighs 16 oz. $10.75 postpaid with 3 Accessories.

DE LUXE MODEL

25,000 r.p.m. Fastest, smoothest, most powerful tool for its type and weight, 12 oz. $18.50 postpaid with 6 Accessories.

GET A DEMONSTRATION

at Hardware, Tool or Dept. Stores, or let us send either model on 10-days Money-back Trial. Catalog Free.

***New* ROUTER and SHAPER**

Convert your De Luxe Handee into an easy-to-handle Router or Shaper that will inlay, rout, carve, make molding cuts to 100th of an inch accuracy. $12.50.

Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Dept. H, Chicago, Ill.

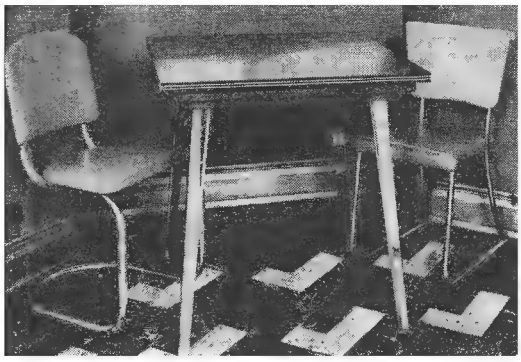
☐ Send Catalog ☐ Router-Shaper Set M.I.-12
☐ De Luxe Model ☐ Standard Model ☐ Send C.O.D.

Name .....

Address .....

New Ideas for Home & Shop

Names and addresses of manufacturers of products described below will be sent free to any reader on request.

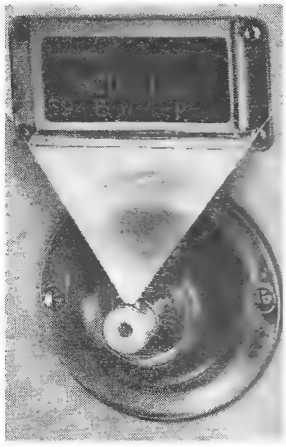


This table automatically adjusts itself to stand level regardless of the floor surface. Individual legs fit into metal sockets with a wedging grip that holds the four feet on the floor.

Inks for marking glass, porcelain and metal. A silver monogram ink also is available.

A portable a.c. arc welder for heavy service. Made in four models, the outputs vary between 300 to 600 amperes. The transformers are designed to permit maximum cooling with the elimination of hot spots in the center of the coils.

A knife useful for carving, trimming and decorating insulating board, for cutting paper, leather, asbestos, rope, cardboard, linoleum, and other similar materials. Extra razor type blades are contained in the cast iron handle.

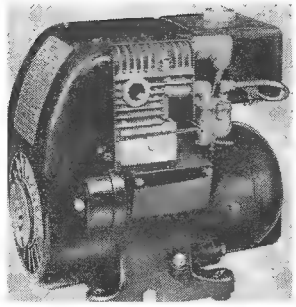


Illuminated by a small electric bulb, this button light makes it easy to read the name on a door plate.

A blue print and map hanger for holding and filing drawings in the drafting room. It will hold as many as seventy-five prints having a total weight up to eighty pounds. Made of duraluminum, all edges are rounded so that prints cannot be torn.

A vulcanizer for making endless belts. Weighing thirty-six and a half pounds, it can be used while the belts are in place on the machine or on a bench.

An all-glass streamlined clearance light for use on passenger cars, trucks or trailers. Installation on a wide range of body curves is made possible by a heavy rubber pad under the metal base.



A gasoline driven generating plant having outputs up to 600 watts.

A portable air conditioner with an adjustable grille which diffuses the air throughout the room to meet varying conditions.

An elastic plastic which is used for mending rubber, leather, fabrics, clothing, linoleum, wiring insulation, and other materials. It is acid and water proof.

A Portable electric drill for operation on a six or twelve-volt storage battery. The chuck takes up to half-inch drill. The drill has no gears, and a specially designed motor gives it high speed for grinding or drilling wood, or a lower speed for drilling large holes in iron.

An automatic mixer using a spring motor. Can be used for preparing malted milk drinks, milk shakes, beating eggs, whipping cream, etc.

A yard light for homes, farms, camps, etc. It is for use around building entrances, private garages, stairways, gates, pumps, and other outdoor locations where good illumination is required.

A sandblast hose which includes a ground wire in it so that discharges of static tend to ground through the hose rather than through the body of the operator.

A small electric ventilator for use in stores, homes, restaurants, taverns, or any other place where forced ventilation is required.

A radio trouble shooter chart for service men and experimenters.

...she couldn't say No to that VELVET aroma

Velvet

—*the MILDNESS* of fine old Kentucky Burley aged in wood

—*the FLAVOR* of pure maple sugar for extra good taste

Velvet packs easy in a pipe
Rolls smooth in a cigarette
Better tobacco for both

Better smoking tobacco

Copyright 1938, LIGGETT & MYERS TOBACCO CO.

PRINTED IN U.S.A.

Chesterfields

...they double your smoking pleasure

Good things are good because of their ingredients. Chesterfields are made from the best ingredients a cigarette can have . . . mild, ripe home-grown and aromatic Turkish tobaccos, cut into long even shreds, rolled in pure cigarette paper, and made just right for smoking.

Millions of smokers say, "Chesterfield's milder, better taste gives me more pleasure."

They Satisfy ..millions

Copyright 1938, LIGGETT & MYERS TOBACCO CO.

Double Page Spreads

fills the air, 10,000 pairs of eyes stalk the streaking darts as though watching death itself circle the track. This is something more than sport. This is something that speeds the pulse and holds you in gripping suspense as you watch in goggle-eyed awe.

This is midget racing. Seven hundred and fifty pounds of blood and iron; of pumping cylinders and turning wheels; of sweaty drivers overflowing from tiny cockpits; of man's ingenuity packed in a thundering crate of metal; of smoke and blinding speed!

This is motordom's contribution to scientific simplicity. Impish in design, stripped of foot brake and clutch, of starter and other gadgets essential to stock cars as well as to other racers, the midgets streak down the straightaways at 70 and 80 miles an hour and take the turns at 40 and 50 bringing the crowd to its feet.

Speed, good driving and the breaks make a race—and sometimes freakish luck such as that of Pete Naccarato. Pete was roaring around the Gilmore track, in Los Angeles, the wheels of his racer just an inch behind the leading car on the turn. As the cars skidded into the straightaway, Pete opened the throttle to pass. At this moment the leading car hit the fence, bounced off, and as Pete swung wide, he was nicked by the skidding car which sent him spinning. Pete was thrown clear but on rolled his driverless car over and over, crossing the finish line just ahead of the other racer with Pete chasing it like a runaway horse. The judges ruled that since Pete's car was the first to cross the finish line, he was entitled to first place although not at the wheel at the time!

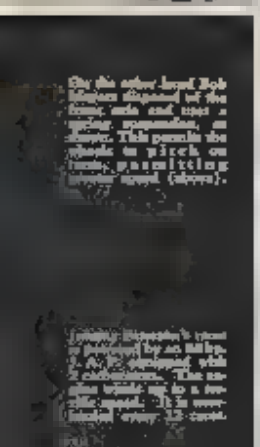
Freak accidents, like Pete's are frequent occurrences. Johnny Peterson, one of the leading drivers on the Eastern tracks this year rode half way round a track on the back of another racer. Johnny was trying to pass on a turn but the car in front clung to the pole. As Johnny squeezed in, he hit the fence, bounced into the other car and his front wheels rolled up over its hood. The two cars clung together for a considerable distance before breaking apart and spilling the drivers. Such spills and thrills of midget racing provide the stuff that makes the crowd roar.

If you wonder what makes the mighty midgets go, look under the hood of these little racers. What you see is a high-powered outboard or an engine lifted from a motorcycle, or a small V8 (still too big for the midgets so that the engine spills over the sides) or perhaps some foreign-made contraption turning up to 6,000 or 7,000 r.p.m., and developing 50 to 80 horsepower. They are usually gearless and clutchless with nothing more than an emergency hand brake used only to affect a skid on the turns, and a dog clutch to throw the car in high to start things moving. And can they move!

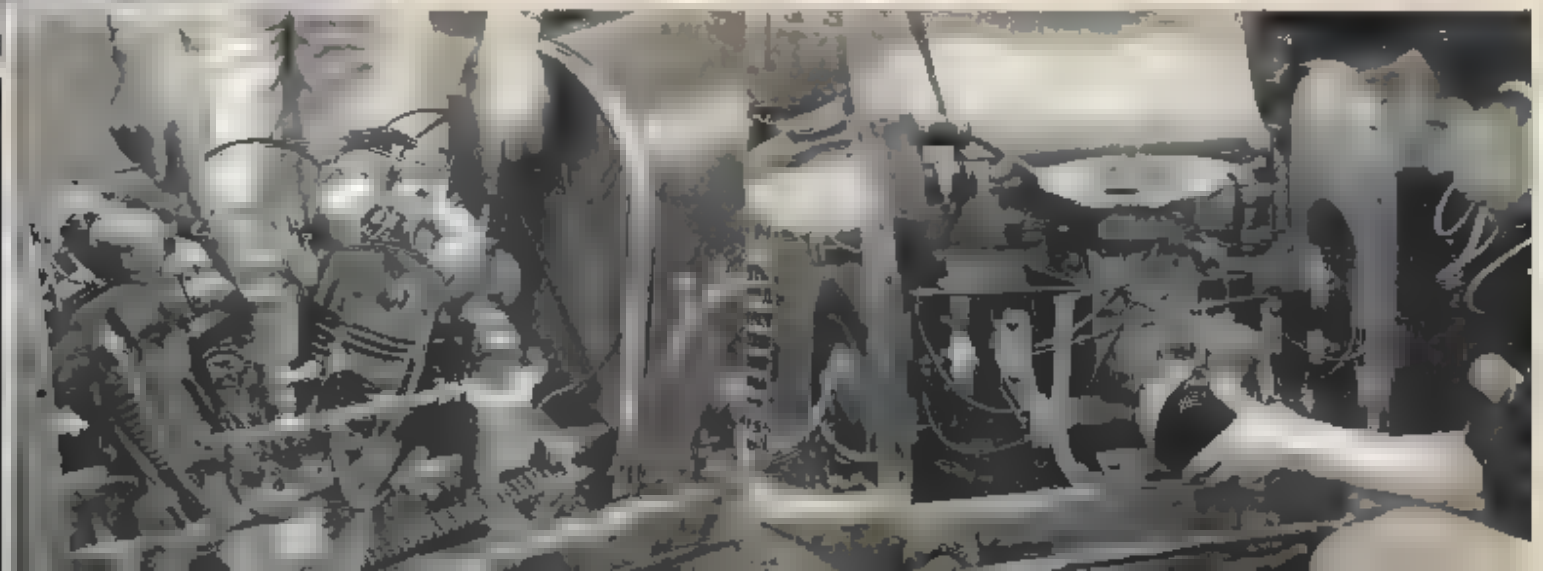
"Texas" Joe Garson roared down a Detroit track at 124 miles an hour driving a midget with an outboard motor. Johnny Peterson thundered across the finish line and was clocked at 121 miles an hour. On the shorter runs such as the ⅛ mile track at Roosevelt raceway in Long Island,

The midgets drift into the turns with throttles open and motors roaring; sometimes come out of them with a burst of speed; sometimes pile up in a heap.

Every driver has his own ideas about how a midget should be built. Jack Wallis (above) swears by his exhaust rule.

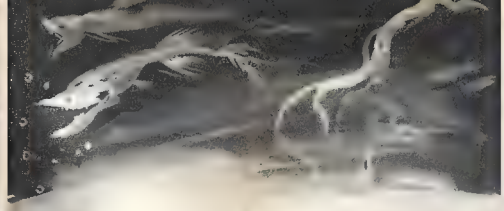


On this color layout Bob Wilcox discussed the three axle and seat arrangement, an advance. This permits the wheels to pitch on rough, preventing [illegible] speed (above).



Next to be shown at Ottawa Queen on trial board before it is delivered the latest on the midget race circles. They wind up aerodynamically back tremendous top speed and pick up. The all-up purchase of Bob Meyer keeps him in the runner.

Left: Two salvage tugs above a sunken steamer lowering a diver to inspect the ill-fated ship.



Right: Tanker aground and breaking up in the heavy seas. Divers salvage its valuables.

"I have covered the ocean bottom from Alaska to Mexico," says Charles E. Smale who tells of his experience 30 fathoms under the Pacific.

THIRTY fathoms under the sea, with a broken face-plate and water gurgling in the ears, is as near to death as any deep-sea diver would care to come. When this happened to me, I had no time to think of death. For a moment I was frantic and I dared not call the tender for fear he would jerk my air lines foul of the wreckage on which I was working. Ripping off my gloves, I jammed them through the broken glass in an effort to plug the hole. Then I shut off the air escapement so that all air must be released through the jagged hole. But it was useless. My suit was rapidly filling with water.

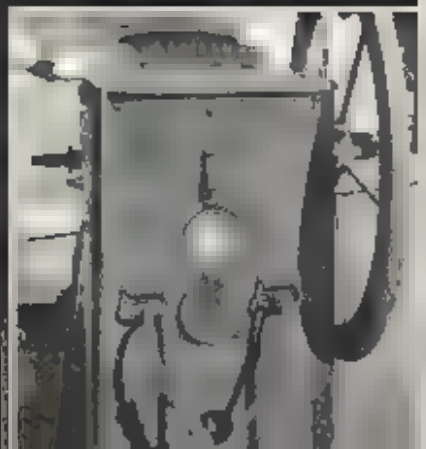
Keeping my voice calm, I reported trouble to the tender and headed for the ladder 200 feet away. I remember reaching the bottom and starting up, rapidly losing consciousness. The water-filled suit lost its buoyancy and confined my movements like an iron straightjacket.

As I neared the top, the water in the suit rose over my mouth and nose. Searing pains shot through my chest from suffocation. My movements were but mechanical as the energy drained from my spent muscles. But with a final burst, I reached the deck, aided by a boost from the tender, and lay there, water-logged, just dimly conscious.

That was my first crucial experience as a deep-sea diver. Since then I have spent more than 10,000 hours under water. I have seen silver coin piled knee deep on the bottom of a sunken gambling ship. I have pulled bodies from airplanes 150 feet under the surface. I have dredged for gold on river bottoms, salvaged steamers, worked on underwater construction and have worked as a "double"

DARING DEATH for UNDERWATER GOLD

The diver above is ready for a plunge to the ocean bottom where only an occasional ray—or 60 pounds at 100 feet.



Above: Standing here a diving suit is a rough fit. Four men, who worked on it, help the suit and Mr. Hale.

Right: Deep sea divers have learned to use electric torches, grappling irons and other mechanical devices to clear away giant kelp behind which may lie glistening gold, silver or other objects.

10,000 TREES in a 15-Foot NURSERY

Tree dwarfing has been practiced in China for 2,600 years. The process is so closely guarded that James F. Craven experimented with more than 100,000 trees before he discovered the secret. How he dwarfs giant trees is told in this story.

By Annie D. Nunn

The dwarfed orange tree bears miniature, full-grown, ripe fruit. Note how the orange compares in size to the decimal point on the page

IMAGINE a forest of 10,000 of the mightiest and most majestic trees in this country confined in a nursery 15 feet square.

That's the achievement of James F. Craven of Glendale. Chief, magician-scientist who dwarfs trees by a secret formula. He has miniature oaks, redwoods, maples, pines and the famous California sequoias that are 15 years old and less than 9 inches high, which if allowed to grow normally would be 300 feet giants.

Imagine grapefruit the size of golf balls and oranges the size of marbles; roses the size of a thumbprint and giant shrub pines that grow in flower pots. This is the story of the scientist who defies nature's laws of modern man who has wrested the secret process from the unfathomable orientals who have been dwarfing trees for 2,600 years. Their closely guarded secret has not only been discovered but actually improved upon.

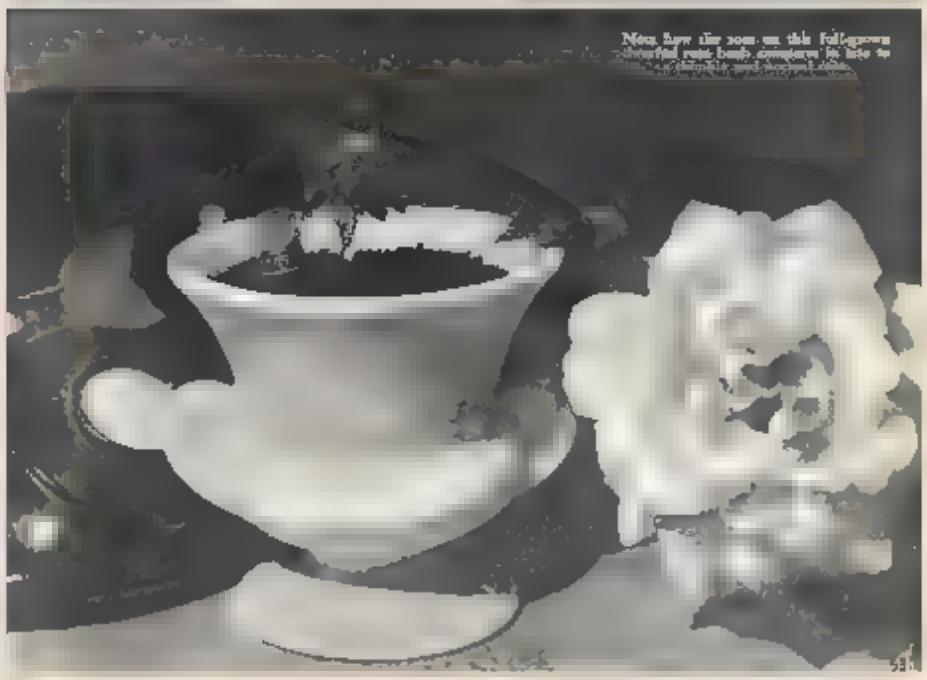
The practice of dwarfing trees was perfected hundreds of years ago and today Japanese farmers especially possess at least one dwarf tree each. Some [illegible] trees handed down from one generation to [illegible] have hundreds of years are [illegible] family trees" since authority traced as they are by weights of various [illegible] record family records for every branch and [illegible] marking has a particular meaning. The Chinese taught the art of tree dwarfing [illegible] but they [illegible] kept the process a dark [illegible] understood [illegible] Craven [illegible] 100,000 trees [illegible] more and find [illegible] dwarfing one to his satisfaction. [illegible] method is an improvement [illegible] the Oriental method in that his trees, after having once been treated by his [illegible] dwarfed, while those produced by the Japanese must be treated from time to time to retard growth. Then, too, Mr. Craven dwarfs all kinds of bark forming plants. The Japanese have been successful [illegible] only the cone bearing trees.

A tree must show its age to be interesting," Mr. Craven said emphatically, "and there is no way of faking age, since trees take on markings only with the passing of time. He held up a venerable fir tree 7 inches tall. There was no mistaking its age. It had knarled twisted arms, a thick trunk and heavy bark. I was also aided with fully developed cones no larger than the head of a pin.

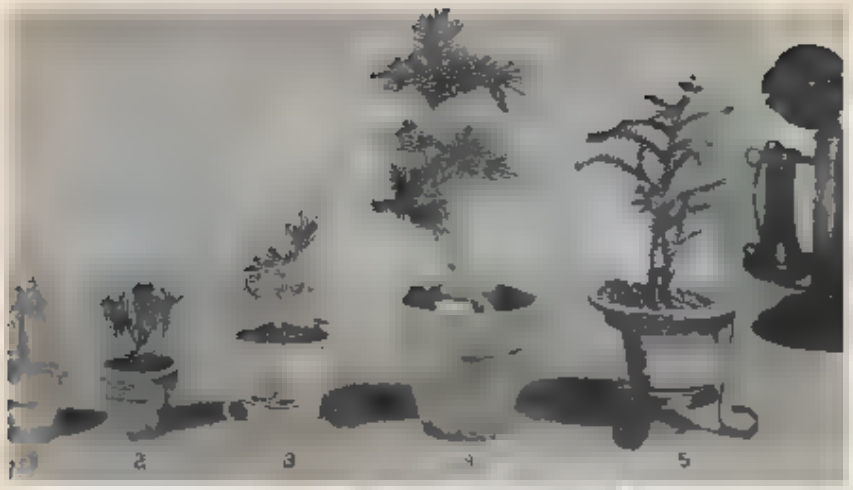
We walked about the grounds of Mr. Craven's home, where numerous astonishing [illegible] are tucked away. Mr. Craven pointed to a tiny rose bush that grew in a shallow bowl in a secluded spot. "It is the same with shrubs and vines," he said. "Notice, for instance, the ruggedness of this bush which is 9 years old and but one and a fourth inches high.

"Why, it's covered with roses!" I exclaimed. "Roses no larger than my little finger nail!"

Mr. Craven extracted a magnifying glass from his pocket. "Take this. It will give



Note how the rose on this full-grown dwarfed rose bush compares in size to [illegible]



The dwarfed fruit-bearing orange tree shown beside its full-grown counterpart at Hamilton Craven's nursery

Mr. James Craven is shown inspecting a rose bush several inches high. The flowers from which it grew are at its left

January until late fall.

Mr. Craven can produce many a tree. He can also produce in miniature,

Parenthetically, Mr. Craven can produce a dwarf tree which s within one year. He does it by cutting the cambrium layer of a branch on a mature tree, known to be 20 years old which has been selected to be the new dwarf tree. This develops the root buds in the cambrium layer of the branch. If properly protected from air, and kept moist, in 6 months the root buds will grow into a perfect root-system on the outside of the bark of the branch while it is still growing on the tree. Then he cuts the branch from the mother tree, with the roots it now possesses, dwarfs the new tree and plants it. The tip of the branch may be cut off, if desired, to get the heavy bark on the trunk of the dwarf. For convenience many of the dwarfed trees are kept in flower pots. I inquired whether this had anything to do with the size of the trees.

"Nothing whatever," he replied, "as trees from seeds which have created cannot obtain normal size no matter where they are placed."

Thus it is not unusual to find Mr. Craven's [illegible] as well as in flower pots and even in the open [illegible]

[illegible] 5 [illegible] [illegible] [illegible]

MI Readers' Service Bureau

IF YOU fail to read the advertising section of MECHANIX ILLUSTRATED you are cheating yourself of learning about many valuable opportunities, for advertisers spend thousands of dollars yearly in producing interesting booklets on a variety of subjects which can help you to secure training for a better paid job, make your home more comfortable and attractive, simplify the problem of automobile maintenance, improve your health, increase the scope of your home workshop activities, etc.

To bring these opportunities to your attention and to simplify your obtaining information from the advertisements that interest you, all the offers made in this issue, with the exception of those in the classified section, are listed on this and the opposite page. Study the list carefully.

It is the function of the Readers' Service Bureau to act as a clearing house for both readers and advertisers. The listing gives offers made, the cost of each, and a convenient identifying number. To simplify the ordering of booklets, samples, catalogs, etc., the bureau will forward your requests to three, or less, of the firms listed.

To take advantage of this service, merely write your name and address on the coupon, mark the numbers of the offers wanted, and mail the coupon to: Readers' Service Bureau, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y. We will do the rest.

If the offer selected is listed as "free," all you have to do is to send in the correctly marked coupon. If there is a slight charge (usually only 3c and rarely more than 10c, to cover cost of mailing bulky catalogs, etc.), be sure to include the correct amount with the coupon. U. S. postage stamps are acceptable.

NOTICE

Don't fail to examine all advertisements in this issue and the offer they make. We are willing to forward three of your requests for booklets, etc., but don't let this stop you from ordering additional material directly from other advertisers. REMEMBER — read the advertisements *carefully*.

Offer No.	Firm	Type of Business	Offer Made	Charge	Page
1	A and N Supply Co.	Outdoor Goods	Catalog	10 Cents	26
2	Ace Tool Co	Tools	Catalog, Instructions, Tool	10 Cents	32
3	Advertising Institute of America	Instruction	Book	Free	14
4	Allied Radio	Radio Supplies	Catalog	Free	143
5	American Landscape School	Instruction	Details, Book	Free	122
6	American School	Instruction	Bulletin & Lesson	Free	17
7	American School	Instruction, Air Conditng.	Details	Free	24
8	American School	Instruction, High School	Details	Free	29
9	American School	Instruction, Mech. Engrg.	Details	Free	26
10	American School	Instruction, Diesel Eng.	Bulletin	Free	32
11	American School	Instruction, Drafting	Bulletin	Free	20
12	American School of Photography	Instruction	Booklet	Free	28
13	Charles Atlas	Health Instruction	Book	Free	16
14	Atlas Press	Tools	Catalog	Free	135
15	Bass Camera Co.	Cameras, Supplies	Price List	Free	32
16	Bausch & Lomb	Microscopes	Book	Free	124
17	L. L. Bean	Hunting, Camping Specits.	Catalog	Free	133
18	Benjamin Air Rifle Co.	Air Rifles	Targets	Free	22
19	Boice-Crane Co.	Power Tools	Catalog	Free	130
20	The Book Supply Co.	Books	Catalog	Free	32
21	Brooks Appliance Co.	Health Appliances	Details	Free	26
22	Brownscope Co.	Telescopes	Catalog	Free	128
23	Bild-Ur-Own Devices	Scooter Kits, Motors	Book, Plans	10 Cents	20
24	Casein Co. of America	Glue	Handbook	Free	21
25	Central Camera Co.	Photo Supplies	Catalog	Free	120
26	Chartered Institute of America Invtrs.	Selling Inventions	Details	Free	28
27	Chicago Technical College	Instructions, Air Conditng.	Lesson	Free	28
28	Chicago Technical College	Instruction, Drafting	Lesson	Free	23
29	Chicago Wheel & Mfg. Co.	Tools	Catalog	Free	145
30	Cleveland Model & Supply Co.	Models	Catalog	10 Cents	20
31	College of Swedish Massage	Instruction	Booklet	Free	142
32	Columbian Correspondence College	Instruction, Civil Service	Catalog	Free	14
33	Coyne Electrical School	Instruction, Radio	Book	Free	30
34	Coyne Electrical School	Instructions, Electrical	Book	Free	18
35	The Craftsman	Woodworking Equipment	Catalog	10 Cents	144
36	Crosman Arms Co.	Rifles	Book	Free	126
37	Henry Disston	Tools	Manual	Free	127
38	Dodge's Institute	Instruction	Catalog	Free	20
39	Dremel Mfg. Co.	Tools	Booklet	Free	120
40	Electrical Salvage	Radio Supplies	Catalog	Free	24
41	Electro Torch	Welding Equipment	Details	Free	23
42	Engineer Dobe	Instruction, Drafting	Book	Free	32
43	Victor J. Evans & Co.	Patent Attorney	Books	Free	13
44	Franklin Institute	Instruction	Booklets	Free	33
45	Foley Mfg. Co	Saw Filing	Plans	Free	143
46	GHQ Motors	Model Engines	Catalog	3 Cents	122
47	A. C. Gilbert Co.	Chemistry Sets	Book	Free	119
48	Gilbert Hall of Science	Toys	Catalog	Free	15
49	Gunmetal Co.	Plating	Details	Free	142
50	Harley-Davidson Motor Co.	Motorcycles	Magazine	Free	121
51	Hemphill Diesel Schools	Instruction	Details	Free	30
52	Hobart Bros.	Welding Equipment	Book	Free	26, 119
53	Ideal Aeroplane & Supply Co.	Model Boats and Planes	Catalog	10 Cents	24
54	Institute of Applied Science	Instruction	Details	Free	30
55	International Correspondence Schools	Instruction	Details	Free	25
56	International Correspondence Schools	Instruction	Booklet	Free	3
57	J & H Metal Products Co.	Tools	Catalog	Free	6
58	Kant-Slam Co.	Hardware	Details	Free	120
59	Kelsey Presses	Printing Presses	Catalog	Free	132
60	LaSalle Extension Univ.	Instruction, Accounting	Book	Free	9
61	LaSalle Extension Univ.	Instruction, Law	Books	Free	20
62	Lejay Mfg. Co.	Electrical Machinery	Plans, Catalog	10 Cents	23
63	Lincoln Airplane and Flying School	Instruction	Details	Free	16
64	Lincoln Engineering School	Instruction, Radio, Elec.	Catalog, Magazine	Free	24
65	The Lionel Corp.	Model Trains	Catalog	10 Cts. 123,	126
66	McSweeney Trade School	Instruction	Book	Free	8
67	Mechanix Universal Aviation Service	Instruction	Details	3 Cent Stamp	32
68	Michigan Trade School	Instruction	Folder	Free	26
69	Midwest Radio Corp.	Radio Equipment	Catalog	Free	22
70	Carl Miller	Patent Attorney	Book and Form	Free	6
71	Albert Mills	General Merchandise	Details	Free	23
72	National Poultry Institute	Instruction	Book	Free	24
73	National Radio Institute	Instruction, Radio	Book	Free	5
74	National Schools	Instruction, Diesel Eng.	Book	Free	18
75	National Schools	Instruction, Radio	Book	Free	26
76	New York Institute of Photography	Instruction	Booklet	Free	142
77	N. W. School of Taxidermy	Instruction	Book	Free	126
78	Northwestern School of Taxidermy	Instruction	Book	Free	142
79	Clarence A. O'Brien & Heyman Berman	Patent Attorneys	Booklet	Free	7
80	Pan America	Musical Instruments	Book	Free	130
81	Plastex Industries	Novelty Mfg. Tools	Book	Free	24
82	Porter Chemical Co.	Chemistry Outfits	Book	Free	19
83	L. F. Randolph	Patent Attorney	Booklet	Free	6
84	Raye Burns School	Instruction, Cartooning	Details	Free	142
85	Reclaimo Mfg. Co	Oil Filters	Booklet	Free	124
86	Re-Nu Tire Groover	Tires	Details	Free	128
87	Rollins Instrument	Drawing Board	Circular	Free	16
88	Harry Ross	Magnets, Microscopes	Catalog	10 Cents	24
89	Shamrock Trailer Parts	Trailer Parts	Catalog	Free	142
90	Silver Mfg Co.	Radio	Catalog	Free	28
91	L. C. Smith & Corona Typewriters	Typewriters	Booklet	Free	131
92	Smooth-On Mfg. Co.	Cement	Book	Free	125
93	C. A. Snow & Co.	Patent Attorneys	Books	Free	27
94	So-Lo Works	Rubber Molds	Book, Buyers List	Free	143
95	South Bend Lathe Works	Tools	Catalog, Booklet	Free	34
96	Speed Way Mfg. Co.	Tools	Circular	Free	132
97	Stamford Co.	Opportunity	Booklet	Free	20
98	Standard Business Training Institute	Instruction	Details	Free	24
99	Tasope's School of Modern Photography	Instruction	Book	Free	130
100	United Factories	Oil Burners	Details	Free	30
101	United Mushroom Co.	Mushroom Growing	Details	Free	26
102	United States Dental Co.	False Teeth	Catalog, Mouth Forms	Free	30
103	Universal Photographers	Instruction	Catalog	Free	30
104	Walker Turner Co., Inc.	Tools	Catalog	Free	119
105	Westwood Correspondence School	Instructions, Airplane Des.	Booklet	Free	24
106	Wholesale Radio Service Co., Inc.	Radio Supplies, Gifts	Catalog	Free	31
107	Wholesale Radio Service Co., Inc.	Radio, Camera Supplies	Catalog	Free	128
108	Wisconsin School of Watch Repairing	Instruction	Details	Free	142

Readers' Service Bureau
MECHANIX ILLUSTRATED,
1501 Broadway, New York, N. Y.

I am interested in the following offers:
(Put numbers in squares) ☐ ☐ ☐

I am enclosing .... cents in stamps
(Ignore this line if all offers are free.)

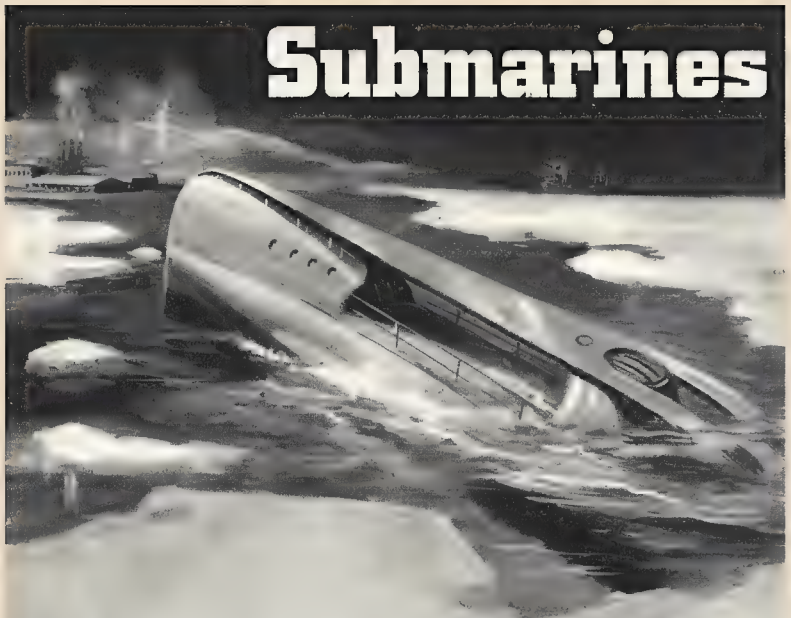
Name

Address

City and State .....

Note: This offer expires January 1, 1939. After this date, write directly to advertisers for offers.

Submarines in the Future



MI'S "BOOK OF THE MONTH"

The material on these pages is reprinted by special permission of the publishers of "SUBMARINE", The Autobiography of Simon Lake, as told to Herbert Corey.

Every month several meritorious books of special interest to readers of MECHANIX ILLUSTRATED are published. The purpose of this department is to bring outstanding books in the fields of invention, science, mechanics and adventure to the attention of our readers.

Those who wish to read these books in their entirety may order them from local book stores or by mail from the publishers.

"SUBMARINE" is published by the D. Appleton-Century Co., 35 W. 32nd St., New York City. The price is $3.

by SIMON LAKE
(Submarine Inventor)
As told to HERBERT COREY

Because of the inventions of Simon Lake (below) the modern submarine runs on an even keel, is controllable under water, it sees instead of being blind, and it may be operated with a good measure of safety and comfort to the crew. Lake obtained more than 100 patents on submarines. The "Defender" was one of the early submarines with special equipment on the superstructure for observing marine life and conditions while traveling under ice.

I AM confident that one of these days I will be able to walk along the cargo docks and see freight packages plainly labeled: "Ship by submarine."

For freight—and passenger-carrying submarine routes are certain to be established sometime. That certainty of the future is casting its shadow on us just as the coming of the airplane and the electric light and radio communication and all the other great advances of our age were signaled in advance. The Wright brothers and Thomas Edison and Guglielmo Marconi did not realize, perhaps, how great was the world's need for these commonplaces of today. Henry Ford did not think he was making over the United States when he tinkered with a gasoline engine in a rickety shop. But they kept puttering around and were laughed at and suddenly their nonsensical ideas became a part of modern life.

Freight and passenger-carrying submarines will come into use because they are a step ahead of the surface ships of today, just as the first wheezy, stuttering steam-engines furnished a better source of power than blind-folded horses walking around a dusty ring.

Trade routes will be established between European and Oriental and Russian ports, and some of our Northern Pacific ports. The distances now covered by some lines using the Suez and Panama canals will be almost cut in two.

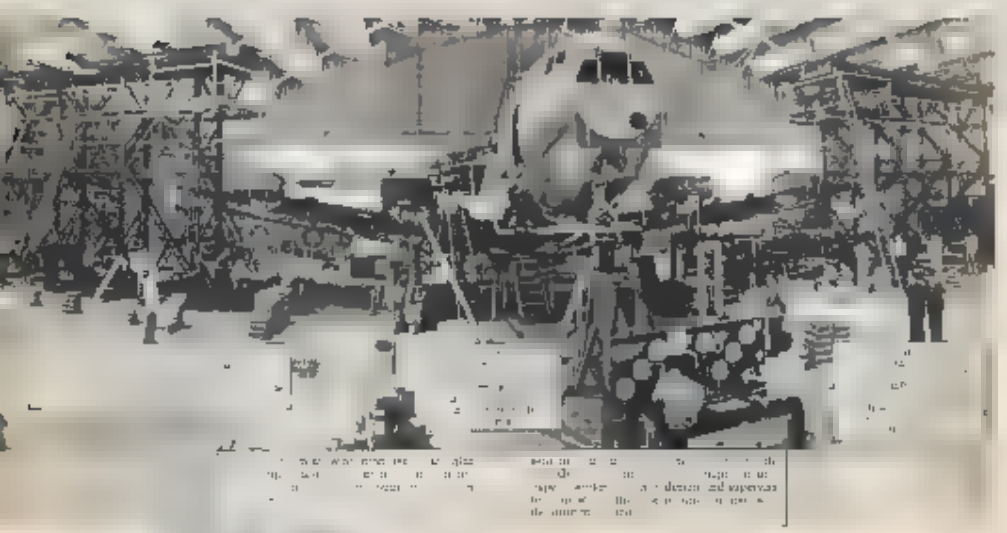
I have previously shown that a submarine is at an advantage as compared with a surface ship because it is relieved of so much dead-weight. In time of storm it need only submerge to a zone of quiet. In good weather it will ride the waves just as the *DEUTSCHLAND* did when Captain Koenig brought her over. Even in the midst of war he only found it necessary to do eighty miles submerged.

Not the least of its advantages is that a submarine can enter ice-bound ports. Vladivostok need never again be closed by the Russian winter. Travel under the ice is more comfortable and safer than bucking winter seas. That has been shown. This is not intended as a bit of sensationalism. It is a simple statement of fact. It is probably true that the reader will recoil at the mere thought of a voyage in the depths of the sea, a lid of ice

[*Continued on page* 123]

"MEN WITH WINGS" CONTEST

Features Many Prizes



CHECK ONE SQUARE FOR EACH QUESTION

1. The first success at airplane flight was made by the Wrights on December 17, 1903. ☐ December 17. ☐
2. The United States Army had no airplanes before the World War. Yes ☐ No ☐
3. Bishop Alcock and Brown made the first successful flight across the Atlantic Ocean. They landed in England ☐ Newfoundland ☐
4. Colonel Charles Lindbergh started his famous trans-Atlantic flight from Richard Beach, Maine ☐ Curtiss Field. ☐
5. The name of Colonel Lindbergh's monoplane was Wiley Post ☐ Spirit of St. Louis ☐ Old Glory ☐
6. The early pioneers were more interested in the development of the airplane as a means of transportation than in its possible value as a weapon of war. Yes ☐ No ☐
7. The first scheduled air mail flights were flown by Army pilots. Yes ☐ No ☐
8. Refrigerated food was carried on the mail flights as was the picture. Yes ☐ No ☐
9. Corrigan flew to Ireland with the aid of a gyro-pilot and other modern direction-finding instruments. Yes ☐ No ☐
10. Wing flaps were invented to make an airplane fly faster. Yes ☐ No ☐

Name and Address

Age

After checking all your answers to the above questions, cut out this coupon, or make a copy of it, and send it, together with your 25 to 50 word essay on the subject: "What is Aviation's Greatest Hero to you?" to the Editor, MECHANIX ILLUSTRATED, 67 Broadway, New York, N. Y.

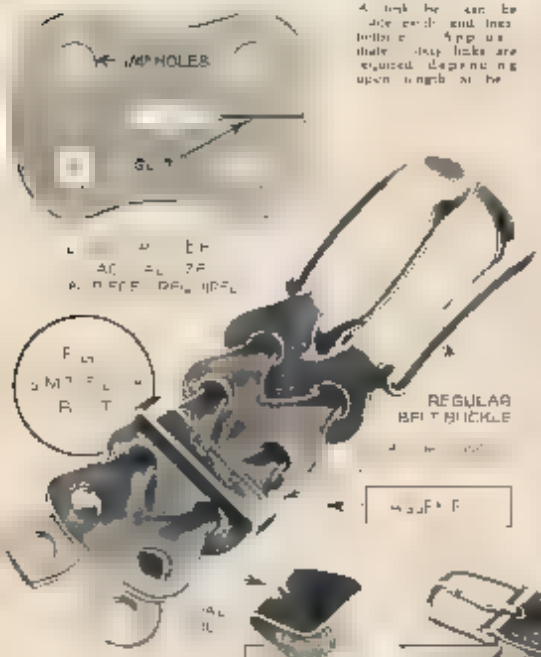
NEW USES for OLD SHOES

by Fred A. Beard

WHY not make a belt from that old pair of shoes you are about ready to discard? I know, I know, don't tell me you don't see a long enough piece of leather in a pair of shoes to make a belt. That proves you've been looking at the wrong part of the shoe. It's about the quickest way to make a belt and by the time you've finished it you'll have learned a lot about leather. By cutting the hide into one inch strips, you'll have enough material to build a great deal of your leather craft equipment. There's no use telling you what else you can make from a pair of shoes. Just look around you and you'll see dozens of useful things made of leather. Some of these are such simple projects as coin or change purses, while others are more complicated styles of belts, belt buckles, wristband, lanyard, key case, watch fob and other items.

And as for equipment, all you need is a leather punch, a pair of scissors and a spike, you are armed to the teeth.

The link belt, for instance, is very easy to make. Its chief claim to fame is the fact that it is nothing of being most handsome and durable. Cut out a piece about six inches long as in Fig. 1 punch four ⅛-inch holes in each end and punch the holes together in succession as shown. Start with the buckle and insert the loop at about the second or third link. The other end is finished with a plain piece doubled sewed around the loop, which are placed as shown. This belt will always fit because it can be shortened or lengthened.



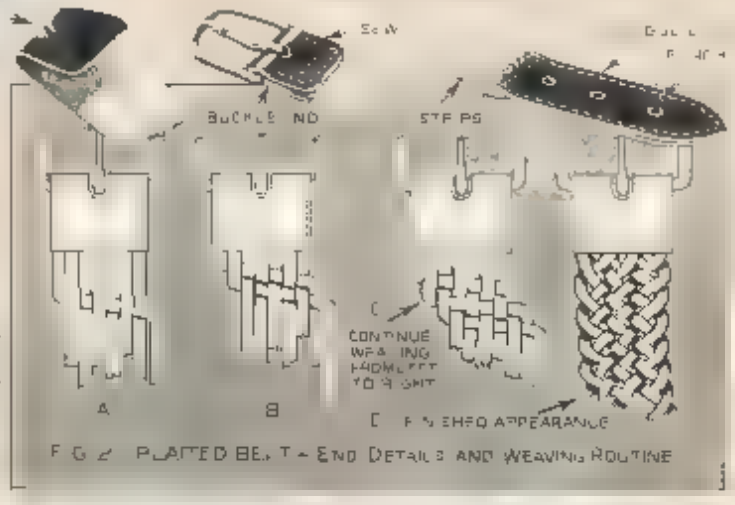
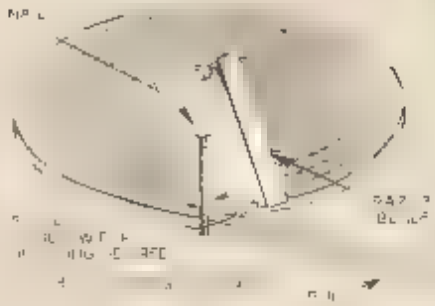


FIG 2 PLAITED BELT - END DETAILS AND WEAVING ROUTINE

Above is shown a sample link belt much as it is shown full size. It can be used as a pattern for making the belt of leather.

Right: When the weaving is completed on the plaited belt it should be pulled firmly each end to straighten out the weave somewhat.



When making any plaited work, first cut the leather into long, thin strips or thongs. Any worn out shoe leather into as large circles as possible. Force a sharp razor blade under the edge of the circle and cut a spiral thong width. After starting the thong with scissors, insert the end of it between the razor blade and the brad, as shown in Fig. 3, and pull gently until the disk is cut spirally to the center. With a little practice, you can "unwind" a leather disc as easily as if it were string.

Short lengths of leather thong may be spliced together by thinning (called *skiving*) the ends and cementing them together, as in Fig. 4.

To make the plaited belt, insert the buckle into the punched piece indicated in Fig. 2 fold back, insert the thong ends close together and sew across it to hold the buckle and thongs in place. Begin to weave with the [illegible] side, as in 2-A, [illegible] becomes the right hand strand. After [illegible] down on the right side [illegible] the right-hand strand. Continue weaving, always from left to right, until the desired length is reached. Finish with a plain end, sewed across the strap, as the other end. By pulling on the ends, the belt can be [illegible]

Above is shown the method of cutting a long thong from a round piece of leather. At the right is shown the cutting in greater detail. The width of the strip will be regulated by the distance you start from inside

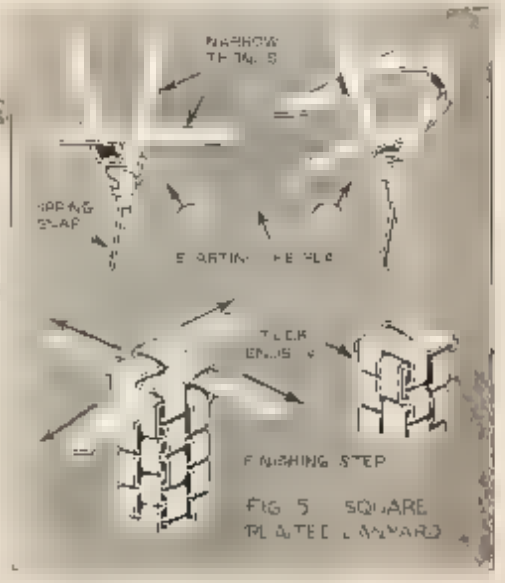
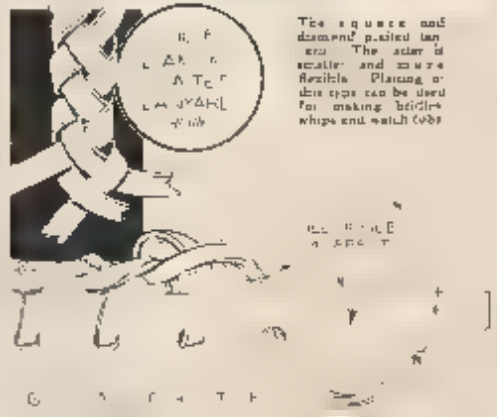


FIG 5 SQUARE PLAITED LANYARD



The square and diamond plaited lanyard. The latter is smaller and more flexible. Plaiting of this type can be used for making bridle whips and watch fobs

Build the MI "SKY FLEA"

Constructed from materials costing only a few pennies, the twin-rudder "Sky Flea" makes steady flights of 300-400 feet.

by John L. Scherer

REQUIRING less than one hour to construct and involving the expenditure of only a few pennies for materials, the MI "Sky Flea" will repeatedly make flights of from 300 to 400 feet under average air conditions. The plans for the wing and tail surfaces are full-scale, simplifying the construction problem.

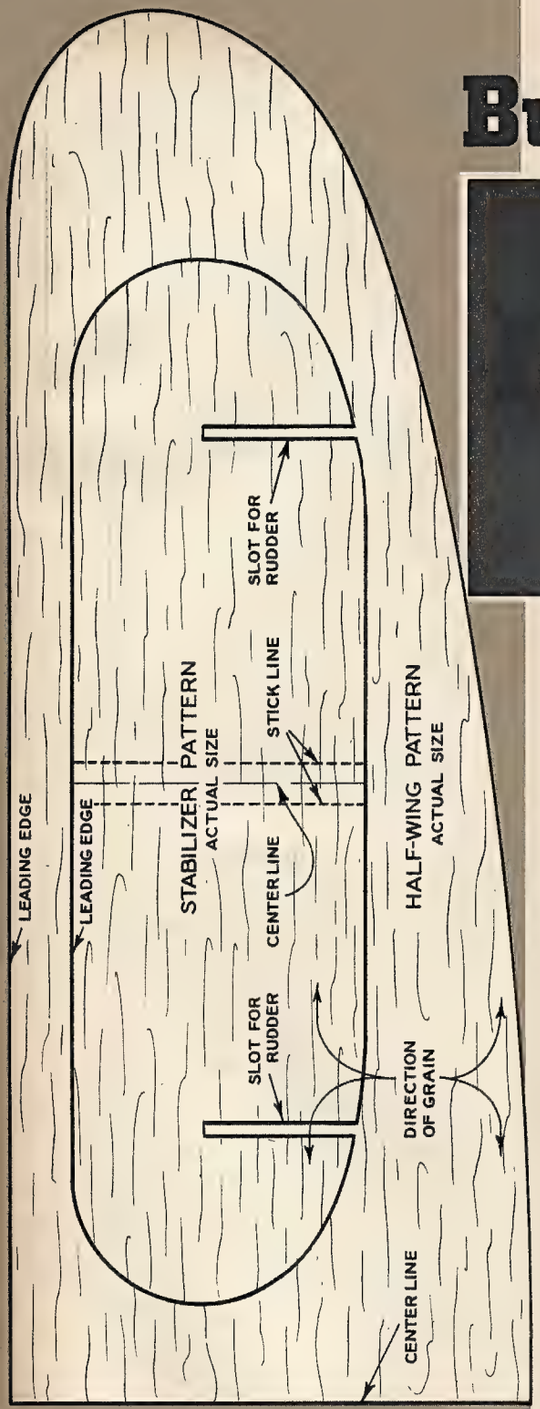
The fuselage or motor stick consists of an 11½-inch length of ⅜x¼-inch balsa stick, sanded to a smooth finish. Cement a propeller thrust bearing to the upper nose end of the motor stick and wind thread tightly around the stick and bearing, as shown in sketch. Cover the wound thread with model cement and allow to dry thoroughly.

Bend a piece of .028 music wire to form a tail hook and insert it into the upper rear end of the motor stick, dabbing model cement over the spot where the hook pierces the wood. Secure a hard wood propeller of a six-inch diameter, pierce its hub with a motor hook, bent to plan shape, and insert the hook through the hole in the thrust bearing, as shown in sketch. Be sure to place a small washer on the motor hook shaft between the propeller and the thrust bearing. String four strands of high grade ⅛-inch flat rubber between the tail hook and motor hook to power the model. A landing gear, bent to plan shape from .028 music wire and equipped with balsa wheels of a one-inch diameter, completes the fuselage assembly. The legs of the landing gear should be 6¾ inches long from the bent point at the fuselage.

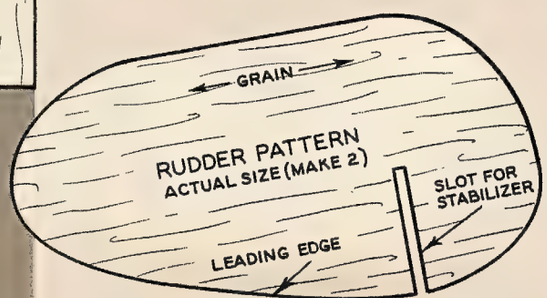
Secure several sheets of standard 18-inch balsa sheeting, 3 inches wide and $\frac{1}{16}$-inch thick and cut out the two 8-inch-long wing halves, stabilizer and twin rudders, using the full-scale plans for a pattern. Sand the sheeting smooth.

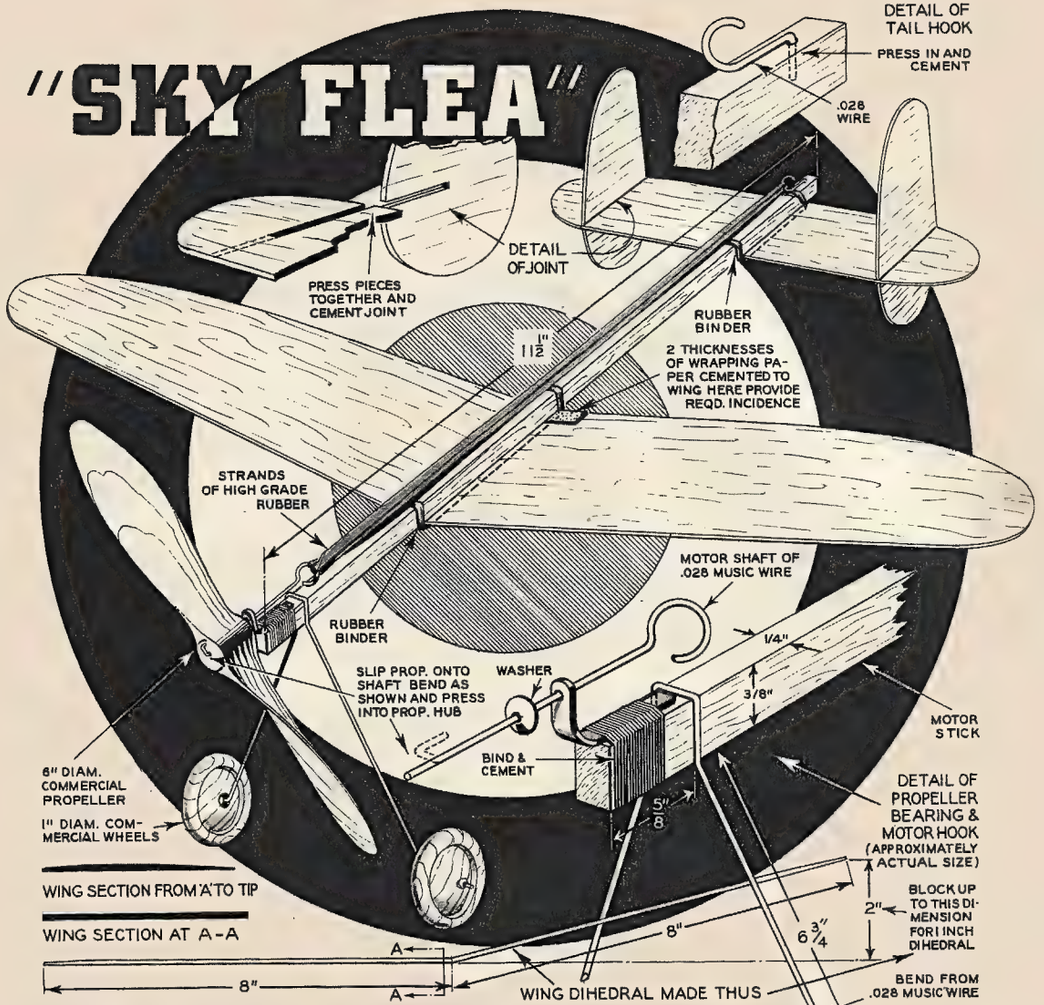
A dihedral, or mild V-shape, should be

[*Continued on page 120*]

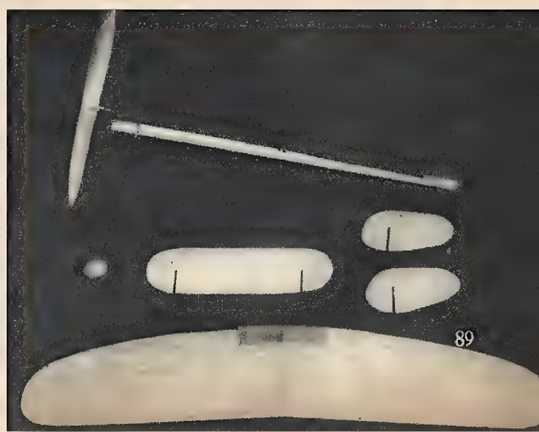


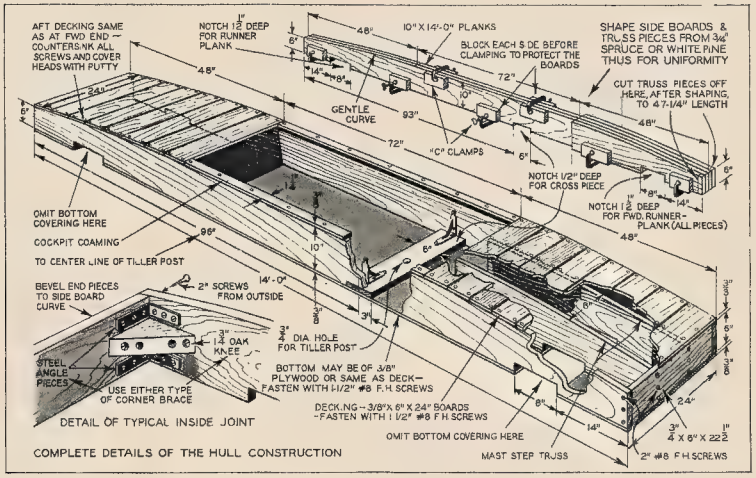
The sketches above and at right show full-scale patterns for making the "Sky Flea's" wing (two half-sections of equal size), stabilizer and rudders. Balsa sheeting of a $\frac{1}{16}$-inch thickness is used and should be sanded smooth to reduce friction in flying through air.





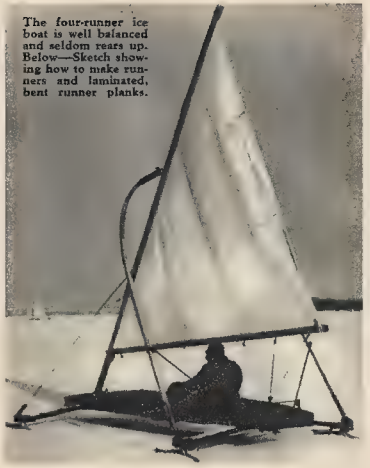
Details of the assembled "Sky Flea" are clearly shown in the sketch above. A hard wood propeller is recommended. To insure stability in flight, the wing of the model should be given dihedral, or mild V-shape, as shown in lower section of the sketch. Below—The unassembled model.




AFT DECKING SAME AS AT FWD END — COUNTERSINK ALL SCREWS AND COVER HEADS WITH PUTTY
NOTCH 1/2" DEEP FOR RUNNER PLANK
10" X 14'-0" PLANKS
BLOCK EACH SIDE BEFORE CLAMPING TO PROTECT THE BOARDS
SHAPE SIDE BOARDS & TRUSS PIECES FROM 3/4" SPRUCE OR WHITE PINE THUS FOR UNIFORMITY
CUT TRUSS PIECES OFF HERE, AFTER SHAPING, TO 47-1/4" LENGTH
GENTLE CURVE
"C" CLAMPS
NOTCH 1/2" DEEP FOR CROSS PIECE
NOTCH 1/2" DEEP FOR FWD. RUNNER-PLANK (ALL PIECES)
OMIT BOTTOM COVERING HERE
COCKPIT COAMING
TO CENTER LINE OF TILLER POST
BEVEL END PIECES TO SIDE BOARD CURVE
2" SCREWS FROM OUTSIDE
3" DIA HOLE FOR TILLER POST
3" OAK KNEE
STEEL ANGLE PIECES
USE EITHER TYPE OF CORNER BRACE
BOTTOM MAY BE OF 3/8" PLYWOOD OR SAME AS DECK—FASTEN WITH 1 1/2" #8 F.H. SCREWS
DECKING—3/8"X 6" X 24" BOARDS—FASTEN WITH 1 1/2" #8 F.H. SCREWS
DETAIL OF TYPICAL INSIDE JOINT
OMIT BOTTOM COVERING HERE
MAST STEP TRUSS
3" 4 X 6" X 22 1/2"
2" #8 F.H. SCREWS

COMPLETE DETAILS OF THE HULL CONSTRUCTION

by J. Julius Fanta



The four-runner ice boat is well balanced and seldom rears up. Below—Sketch showing how to make runners and laminated, bent runner planks.

will quickly show the necessary details and dimensions to be observed. Any good grade lumber may be used for the 14-foot side boards but ¾-inch clear white pine or spruce is recommended.

The two 14-foot boards and the two 48-inch truss members which brace the mast step should be clamped together as shown and shaped and mortised as a single unit. This ensures uniformity. The notches for the runnerplanks are 1½ inches deep to take the planks flush.

Put in the ¾x6x22½-inch end boards and brace the corners either with oak knees or with corner irons as shown in the detail sketch. A further cross member of ½x6-inch stock is put in to stiffen the structure and to serve as a base for the tiller post.

Leaving entrance for the runnerplanks, cover the entire bottom with ⅜x6-inch boards or ⅜-inch plywood. Now drill through the cross-member and bottom for

BUILD "ICE-SPRITE"

Front view of the four-runner "Ice-Sprite" showing the bow-shaped stays. The drawing above shows hull construction details.

THE four-runner iceboat is here for those who demand the most up-to-date innovation in this thrilling sport.

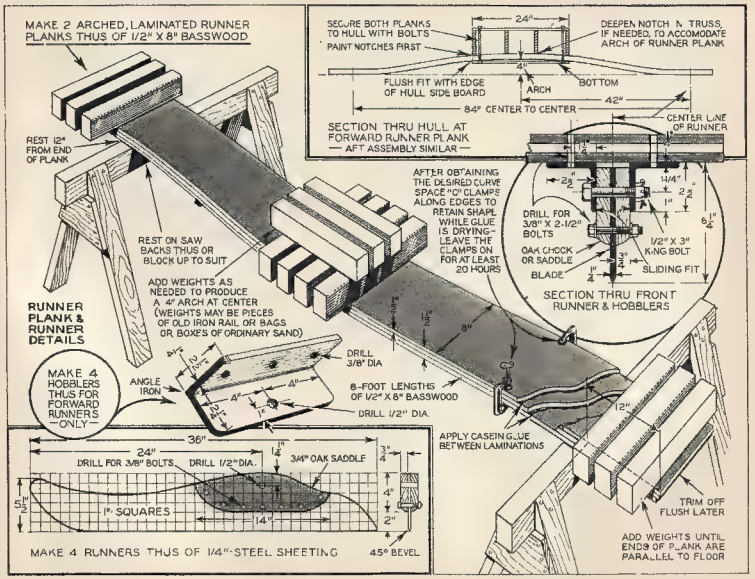
The four-runner "Ice-Sprite" design has several features embodying greater safety. With four-cornered support, it rears up and hikes less. Moreover, the hull and sail does not tip forward or backward, as do other types. Because the position of the sail is stationary, capsizing is less likely to occur.

In straight going, the rear runners track in the cuts of the fore runners. Thus with two tracks instead of three, friction is reduced and more speed is possible. As it weighs only 210 pounds, it sails and rides easily with added comfort from two runnerplanks. The cockpit is large enough to accommodate two or three persons.

"Ice-Sprite" will not spin. Designed with even balance, it requires no anti-capsizing skids on the runnerplank ends. The hull is symmetrical so that it can be steered in front equally well by reversing the direction of the runners and stepping the mast reversed on the after deck. The sail area is only 75 square feet.

Build the scow-shaped hull first. Straightforward and simple construction is used throughout and a glance at the hull drawings

A FOUR-RUNNER ICE BOAT


MAKE 2 ARCHED, LAMINATED RUNNER PLANKS THUS OF 1/2" X 8" BASSWOOD
SECURE BOTH PLANKS TO HULL WITH BOLTS
PAINT NOTCHES FIRST
DEEPEN NOTCH IN TRUSS, IF NEEDED, TO ACCOMODATE ARCH OF RUNNER PLANK
FLUSH FIT WITH EDGE OF HULL SIDE BOARD
ARCH
BOTTOM
84" CENTER TO CENTER
CENTER LINE OF RUNNER
SECTION THRU HULL AT FORWARD RUNNER PLANK — AFT ASSEMBLY SIMILAR —
REST 12" FROM END OF PLANK
AFTER OBTAINING THE DESIRED CURVE SPACE "O" CLAMPS ALONG EDGES TO RETAIN SHAPE WHILE GLUE IS DRYING—LEAVE THE CLAMPS ON FOR AT LEAST 20 HOURS
DRILL FOR 3/8" X 2-1/2" BOLTS
1/2" X 3" KING BOLT
OAK CHOCK OR SADDLE
BLADE
SLIDING FIT
SECTION THRU FRONT RUNNER & HOBBLERS
REST ON SAW BACKS THUS OR BLOCK UP TO SUIT
ADD WEIGHTS AS NEEDED TO PRODUCE A 4" ARCH AT CENTER (WEIGHTS MAY BE PIECES OF OLD IRON RAIL OR BAGS OR BOXES OF ORDINARY SAND)
RUNNER PLANK & RUNNER DETAILS
MAKE 4 HOBBLERS THUS FOR FORWARD RUNNERS —ONLY—
ANGLE IRON
DRILL 3/8" DIA
8-FOOT LENGTHS OF 1/2" X 8" BASSWOOD
DRILL 1/2" DIA
APPLY CASEIN GLUE BETWEEN LAMINATIONS
TRIM OFF FLUSH LATER
ADD WEIGHTS UNTIL ENDS OF PLANK ARE PARALLEL TO FLOOR
DRILL FOR 3/8" BOLTS
DRILL 1/2" DIA
3/4" OAK SADDLE
1" SQUARES
MAKE 4 RUNNERS THUS OF 1/4"-STEEL SHEETING
45° BEVEL

Northern Snowshoes Are Easy To Make

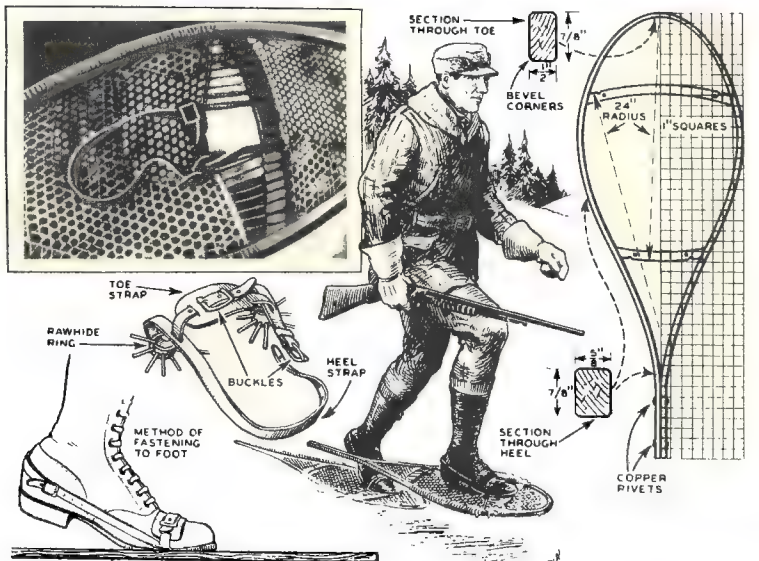


Fig. 1. Sturdy and durable, these snowshoes are ideal for hunters and trappers. Photo shows completed snowshoe, while below it is the toe strap detail. Frame is bent according to dimensions given in squared pattern and secured with copper rivets.

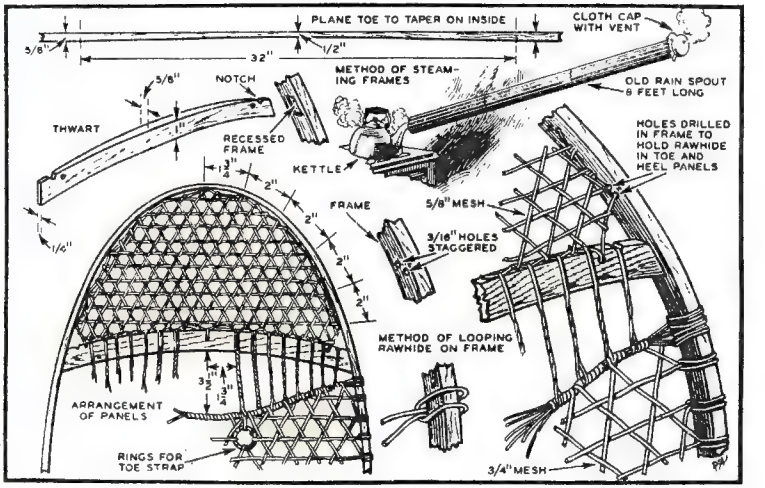


Fig. 2. The various steps in the bending of the snowshoe frames and weaving of rawhide thongs are illustrated above. Bend the frames slowly so that they do not break and draw the thongs as tight as possible. The detail at extreme right shows the manner in which thongs are secured to thwart and frame, and in heel and toe sections. Frames are protected with linseed oil.

by Hi Sibley

TRAPPERS, hunters, winter hikers and outdoor men in general will find these simple snowshoes just the thing for negotiating the landscape when the snow is piled neck deep all over the scene. The design was taken from a pair of genuine Canadian snowshoes, so you can be sure that you will be constructing the real thing.

Construction presents no real difficulties and cost has been reduced to a minimum. Some care will be required, however, in bending the toe of the frame, and in getting the rawhide lacing tight. In fact, the success of the project depends largely upon these two factors.

Select two straight-grained pieces of hickory 8 feet long and ⅞-inch wide at the center, which is to be the point of the toe. Begin 32 inches from the ends, and plane one side only, which will be the inside when the frame is bent, as shown in Fig. 2.

After the corners are beveled the frame members should be thoroughly steamed before attempting to bend them. This can be done by placing them in an 8-foot section of old rainspout or a long box, tying a cloth with small vent over one end and inserting the spout of a tea kettle in the other as shown in Fig. 2.

The outer end should be elevated a foot or so, and steaming continued for at least an hour.

Prepare a form around which the sticks are to be bent, laid out as shown in the squared chart in Fig. 1. This can be nailed to a cellar or garage door, where it is exposed to the sun. Do not attempt to bend to the final shape all at once, but work it around gradually to ease the strain.

Thwarts, or cross-members made of hickory, as shown in Fig. 2, should be installed just before the heel ends are brought together and riveted. Note that the ends of the thwarts are set in mortises or recesses in the frame, chiseled about ¼-inch deep. Secure the heel ends together with copper rivets or $\frac{3}{16}$-inch brass bolts located, as shown in Fig. 1.

The frame is now ready for lacing. For the toe panel use strips of rawhide about ⅛-inch wide. Fig. 2 gives the general arrangement of the rawhide, but do not expect the finished job to have any such geometric regularity. The utility will not be affected.

Beginning at the toe drill a pair of $\frac{3}{16}$-inch holes, staggered and about ¼-inch apart, and 1¾ inches on each side drill two more holes with four more pairs down each side, spaced 2 inches apart. These are for anchoring the rawhide loops which hold the lacing.

Each pair of loops along the edge of the frame should be drawn as tight as possible. Tie each pair separately so that when they are all completed, the edge of the front section of the frame will consist of individual units. The heel panel is laced in a similar manner.

For the central panel which supports the foot directly, use $\frac{3}{16}$-inch strips of rawhide, arranged as shown in Fig. 2, with an open space in the center just above the user's toe, and two rawhide rings for receiving the foot strap. Note that in the central panel the thongs are looped over the frame.

No matter what the finished appearance, the snowshoes will perform satisfactorily if all the thongs are taut, but if they are loose the shoes will be very difficult to use. A toe-and-heel strap is made as shown in Fig. 1 and looped through the two rawhide rings.

A little practice will quickly give you the knack of walking on snowshoes. When moving forward the shoes are dragged close to the snow, rather than lifted, as in the case of skis. One shoe is advanced to the point where the heel section of the front shoe fits around the side of the toe section of the rear shoe, and so on. Turning is a matter of swinging one shoe completely around in the opposite direction and following it with the second shoe, which is brought up alongside the first. You'll soon acquire all the tricks in the trade.

EXPERIMENTS WITH MAGNETS

Magnets may be made by placing an iron or steel bar within a coil of wire and passing a strong electric current through the wire. The bar will become magnetized and will remain so for a long time after the current is switched off. The strength of the magnet depends upon the number of turns of wire in the coil and upon the strength of the current flowing through it.

The repulsive powers of these magnets are suggested here. The magnet at the right is pushing up on the one on the left, causing it to float in the air. A magnet may be kept floating in the air by placing another magnet above it.

Like poles of a magnet repel each other. When the north and south poles of the two magnets are placed together as shown, the top magnet will be thrown upward several inches if it is released suddenly. Fingers are suddenly removed.

powerful are these new magnets that they have the capacity of exerting their influence even through thin sheets of non-magnetic material. Here a magnet is held in reliance above a magnet of steel. Even though the two magnets are kept separated by the thickness of a sheet of glass

A steel ball bearing will be held in suspension between the two magnets above and thus permit the lower magnet to turn freely. The photograph shows the position taken by the ball bearing after it has come to rest.

A small piece of iron or steel may be made to float in the air by placing it between two magnets. Here a magnet is held above a magnet. Even though the two magnets are kept separated by the thickness of a sheet of glass, the magnetic attraction is sufficient to hold the steel bar in suspension.

power these new magnets possess is great that a long string of steel bars can be lifted in air. To accomplish this the bars should be lined up in a small grooved board as shown above.

An ordinary iron steel bracket can be balanced on one pole of these new magnets if the pole is held in a steady position. The bracket must be carefully adjusted to the correct angle. The slide shows the lines of force which appear when the magnet is placed under a piece of glass covered with steel filings.

The more powerful a magnet is the more it will tend to point to the magnetic north pole. Ordinary magnets do not show a very pronounced motion but the new alloy magnets fully demonstrate the action when at the end of a string as shown.

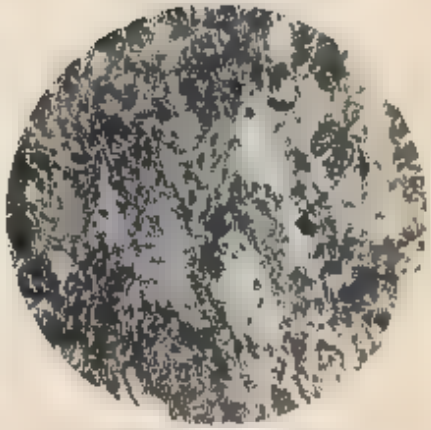
In this beaker of water a small piece of steel is prevented from sinking to the magnet head near the outside of the glass. Two thin pieces of steel are used, the magnet can be held as far away as one inch with the same result.

Here is a magnet suspended as nothing but thin air is attracted to the anchored magnet with such force that gravity does not cause it to fall. Even though it is separated from the stationary magnet by approximately a quarter of an inch

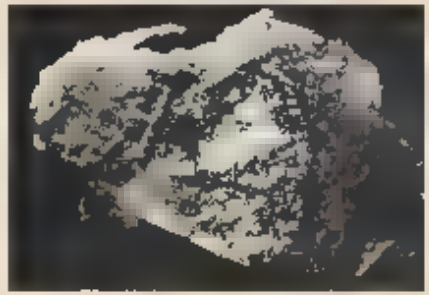
MINERALS MAKE COLORFUL MOUNTS FOR THE MICROSCOPE

by Julian D. Corrin, [illegible] Ph. D.

A simple pillbox with specimen of pyrite mounted on a cork pedestal is the easiest for low power examination with strong reflected light. The box interior is painted black.



A professional type of microscope slide prepared as a thin section for study by transmitted light. Such a slide reveals the details of rock structure.



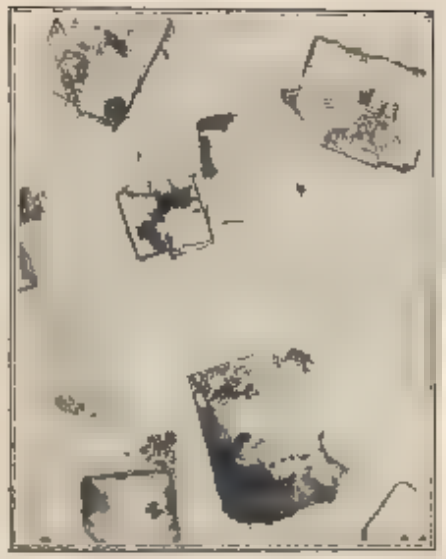
Photograph of a pill box mount of one of the crystals with polarized light. The crystals that appear as white in the photograph actually are all the colors of the rainbow.

IF BEAUTY is a quality to be sought for its own worth, then beautiful objects are to be desired whether or not they possess other values. Hence the amateur microscope enthusiast often searches for materials to delight the eye regardless of other considerations, knowing that the many scientific objects of interest to him are rarely prized minerals easily headed by gems. Such beauty is not always easy to find, for it is a matter of hand in hand and frequently requires magnification for their full appreciation. Mounting these objects for microscopic study is very simple and quite naturally the subject is a favorite [illegible] with beginners in microscopy. Some examples will make these points clear.

The pillbox mount of mineral specimens is one suited for low power examination by reflected light. From your druggist secure a number of small pillboxes preferably of the cubical type and some cork stoppers or sheet cork. For each box construct a small pyramid of cork and affix by its base to the bottom interior of the box with [illegible]. Paint the cork and box interior black. The pyramid should raise the mineral specimen about half way up from the bottom of the box. Cement the mineral to the apex of the cork, label the box and appropriately, and keep stored with the lid open when not in use.

Many minerals are suitable for these mounts. Among them are crystallized specimens of native gold, silver and copper; very small examples of well-formed crystals of fluorite, several types of precious opal, and many varied and striking types of quartz crystals [illegible] can be had from any dealer in geological supplies. Particularly easy to [illegible] are the quartz crystals known as rock crystal, amethyst, smoky quartz, rose quartz, and others. Small cylinders for box mounts may be obtained from dealers at trifling cost.

For mounting the specimens with the lowest available magnification, I [illegible] a standard microscope objective, screwing the [illegible] combination of the low power 16mm objective, thus converting the lens into one [illegible] 10mm [illegible] focus. A high power eyepiece, preferably the [illegible] 7X or 8X, with the 8X eyepiece this yields a total magnification of 50X. 70X [illegible]



Crystals of potassium ferricyanide photographed with polarized light. Compare this with the photograph at right.

The same slide under ordinary light, showing greater detail unfortunately the aluminum [illegible] the result is colors

[illegible] mirror [illegible]. A lens accessory placed on the [illegible] which is designed to [illegible] instantly by the [illegible]

[illegible] purchase a separate 42mm or 48mm lens, desired, and [illegible] this into the [illegible] eyepiece for low power work and [illegible] possible to secure especially long [illegible] with a power of only 2X. For [illegible] models, in which the objective [illegible] not be taken apart, special low power [illegible] pieces are available in the case of the [illegible] microscope are [illegible] magnification as the desired 70X.

Illumination is a most important consideration in this work. It must be strong and directed [illegible] into the box mount from above. [illegible] by pointing a lamp source concentrated by using a small mirror [illegible] and [illegible] microscope [illegible] and taken [illegible] Many amateur [illegible] have developed substage mirrors which can be [illegible] and plugged in above the [illegible] lighting purposes.

Mineral specimens may [illegible] sides [illegible] covered by [illegible]

some small [illegible] earrings and pendant one of these [illegible] piece from black photomount paper so that it will fit snugly within the ring and cement this to the slide also. Then paint the ring black. Cement in the mineral crystals and warm the slide to drive off all moisture and seal on a circular cover glass of the proper size. Note that the deep-well slide thus made contains air and is not to be filled with balsam.

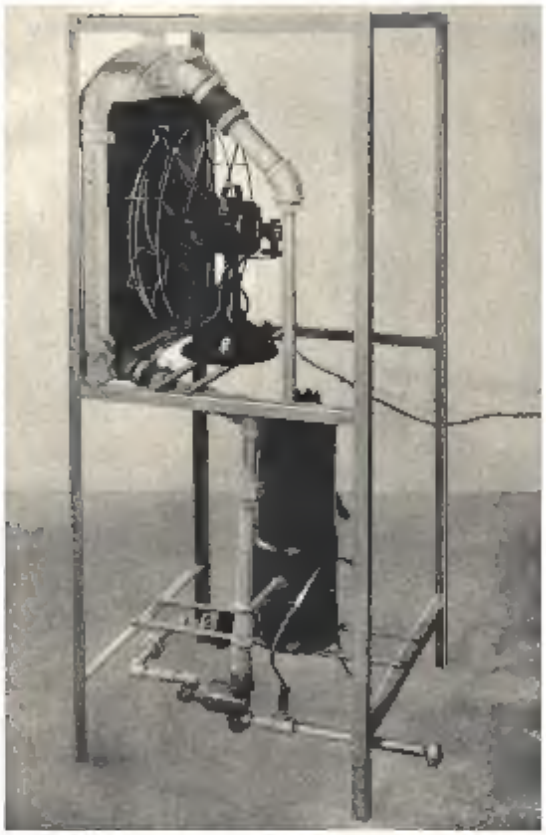
[illegible] gold [illegible] cover glass first heated with a forceps and passed rapidly several times over [illegible] the [illegible] of a flame such as that from a bunsen burner or alcohol lamp. This drives off any traces of moisture and is [illegible] necessary in humid climates. Should moisture be present within the well, it will collect as a fine mist on the under surface of the cover glass and then must be removed, the well dried thoroughly and a new cover applied.

Various sands make interesting deep-well mounts. Prepare the black well as before. Sprinkle a small amount of a given sand upon

[Continued on page 124]

Automatic Hot Air Heater for Shop or Office

by Robert Gregg



CAPABLE of maintaining a comfortable room heat in zero weather, this automatic hot air heater is an ideal unit for the small shop or office. It is efficient and economical in operation, and, with thermostatic control, requires no attention other than adding to the water supply in the radiator from time to time.

The mechanics of the installation can be seen in the photographs. The heating unit is the familiar coil-type gas heater. This heats the water, which, when hot, rises to the top of the radiator. A fan mounted behind the radiator sends a warm current of air out into the room. The water returns to the heater and continues to circulate. A pipe leading from the return water line connects to a thermostat, the thermostat checking or turning on the gas according to the heat of the water.

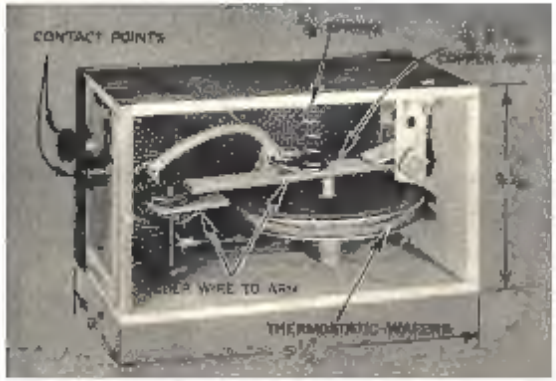
The dimensions given are a fair standard, but can be varied to suit. It can be seen that the width of the angle-iron framework must be made to fit the width of the car radiator selected for the job. The coil heater is of medium size and costs approximately five dollars.

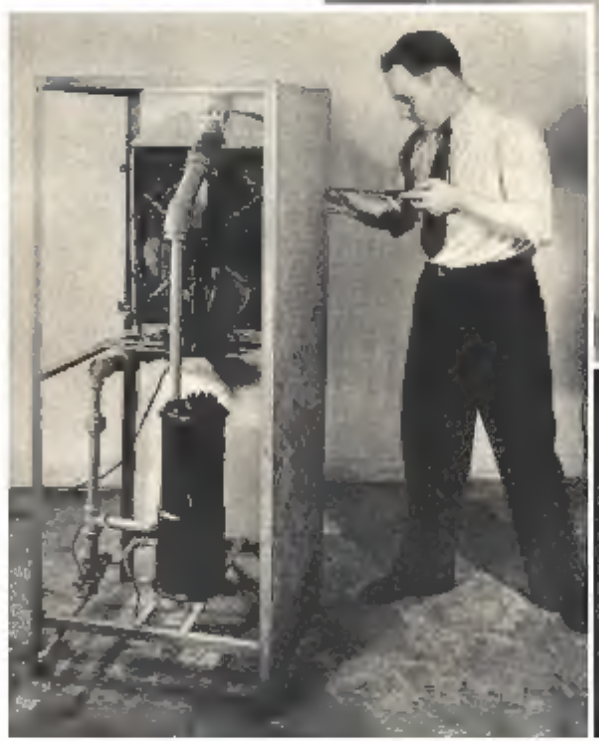
The fan should be about 12 to 15 inches in diameter. If this is not available, two smaller fans can be used. The thermostat is a standard type for controlling the flow of gas when used for heating water. It can be set for any temperature from 100 to 180 degrees, and will control the flow to maintain the temperature for which it is set. A setting of about 150 degrees is recommended for the unit shown.

A second thermostat controls the fan. This type of thermostat can be purchased at a nominal cost or made as shown in the photograph. Two thermostatic wafers are re-

Above—The completed heater just before the sheet metal covering is fastened in place. The thermostat for turning the fan on or off is not shown in this photograph. The fan should have 12 to 15-inch diameter blades.

Right—This is a home-made thermostat used for turning the electric fan on or off. With the exception of the wafers, all the parts are of the type found in the average home workshop. The wafers are the type that can be purchased at most electrical or hardware stores.





Above—The finished heater covered with sheet metal. The top should be removable so that water can be added to the radiator when needed. In most locations it will not be necessary to cover the back. One or two coats of paint of a color to match the rest of the room will greatly improve its appearance.

The heater should be fitted with a stack so that the burned gas fumes will be led outside. Bolts and nuts can be used to hold the outside covering in place.

DRESS UP YOUR PRINTS

Simple paper "masks" lend decorative note to unmounted pictures.

by Kenneth Murray

The novel mask used here was merely a negative made by photographing a sheet of corrugated paper of the type used for show-window dressing.

This border was made by photographing a cardboard portrait mount. Other materials, such as wallpaper, buckram book cover, etc., may also be used.

IF YOU want your pictures to stand out from the ordinary, here is an interesting and practical method of doing it. The "salon" type of photographer has used a variation of it for years, and so has the professional portrait maker. How is it done? *Dress up your prints!*

Masking offers the easiest and least-expensive method because with a paper or film mask or two, and nothing else, your contact or enlarged prints can be given the desired touch of individuality.

Quite likely you have been making your prints with an ordinary, square-cornered paper or metal mask, as has most everyone else. As a variation, use round corners. The black paper with which cut films are packed, if given a thin coat of shellac or varnish, is an excellent material from which to cut masks. A practical method is to cut a cardboard template on your paper trimmer, lay it on the black paper and use it as a guide

Above: Masks for enlarging should be attached to sheets of clear glass, which are then placed over the enlarging paper on the easel. Above, right: This simple but effective masking arrangement was adapted from the method used to decorate newspaper ballyhoos. Narrow strips of gummed red paper were attached near the edges of a sheet of glass, which was used under the negative.

Double printing masks, cut out of black paper as shown above, permit two pictures to be combined on a single large sheet of printing paper.

Above: The border for this picture is merely a negative made by photographing a small wooden picture frame. Right: When used for contact printing, the paper mask is simply placed over the negative.

HINTS FOR CAMERA FANS

Clippers Round Print Corners

A NAIL clipper may be used to considerable advantage in photographic work, particularly in rounding the corners of negatives and prints. Clipping the sharp corners of negatives eliminates the possibility of scratching the emulsion when films are stored in a box.

Sharp Shadows With Photoflood Lamps

AN EXCELLENT way to obtain raw, undiffused light for special effects is to make a "window" on photoflood lamps that have outside frosting. Such a lamp can be made to cast a clear shadow by spreading a thin film of glycerine or sodium silicate over the lower part of the bulb. Either liquid temporarily hides the frosting. It is easily wiped off later.

"C" Clamp Holds Floodlight Lamps

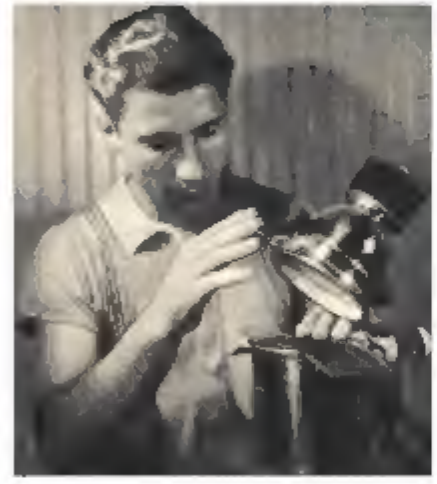
A 10-CENT "C" clamp substituted for the regular spring clamp on portable floodlights serves as an excellent grip. Soft rubber washer between jaws of clamp prevent damage to chairs and woodwork. Some clamps require filing a notch in center.

Negative Pencils

THE so-called "negative" pencil is a grease pencil available from art supply stores and is useful for writing on smooth surfaces, bottles, prints and labels. It shows up very clearly on surfaces that will not "take" markings from ordinary lead.

Lens Filter Strap Attaches To Wrist

RIVET several wood discs to a leather strap that fits about the wrist. Lens filters may be slipped on these discs to facilitate their handling.

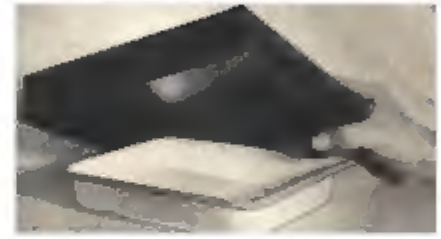


Keeping Negatives Cool

A GOOD way to protect negatives by dissipating heat generated by the lamp housing is to cut a negative mask of sheet copper long enough to project several inches from each side of the enlarger. It should be painted a dead black.

Increasing Angle Of Spotlight

BY ADDING a bent steel or brass rod between the lamp and upper part of a reflector stand, it is possible to increase the angle at which a spotlight or reflector may be tilted.



Cover For Developing Tray

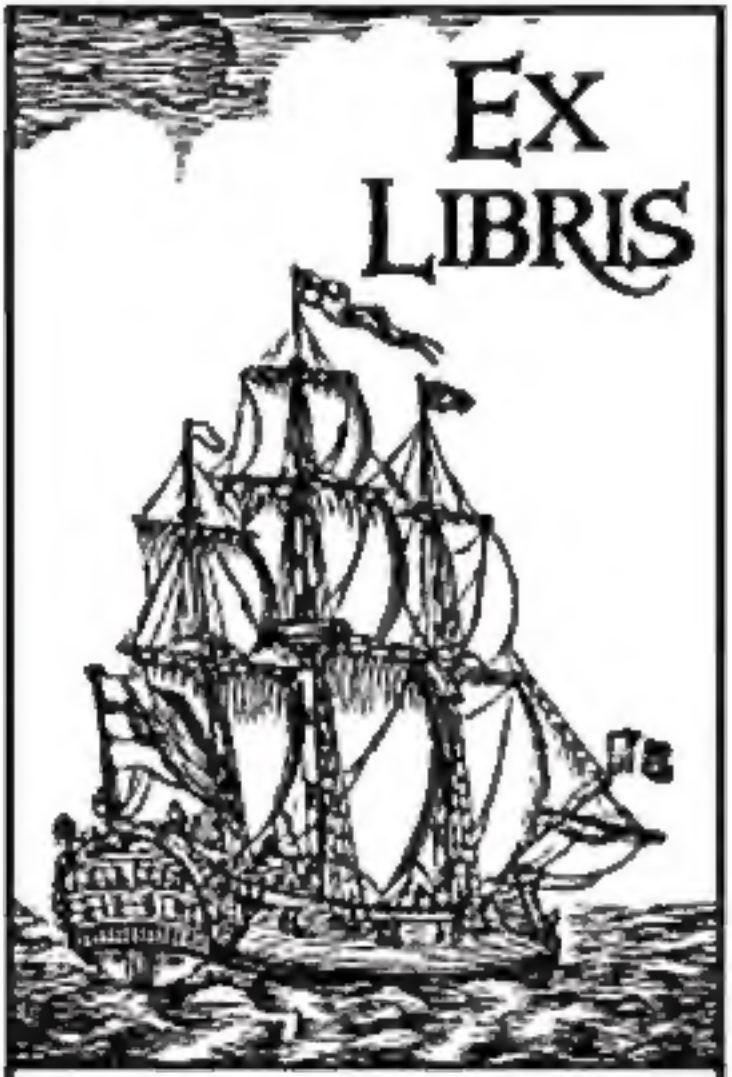
A COVER made of cardboard or sheet metal, painted a flat black and which may be slipped over a developing or fixing tray, serves as an excellent safeguard against fogging.

Iodine Removes Black Spots

ORDINARY tincture of iodine will remove black spots from prints that are due to pin holes. Apply the chemical with a swab of cotton on the end of a tooth pick. Then refix the print in plain hypo. The spot may now appear too white but a little spotting with a soft pencil will correct it.

Wire Tripod Brace

THREE strips of stiff wire cut from clothes hangers serve as excellent tripod braces. Drill facing holes in the tripod legs, push the wires through and bend one end. The wires will hold in place through their own springiness.



Anon. Malefactor